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JOURNAL

OF THE

ASIATIC SOCIETY.

No. III.—1850.

Extracts from DR. VOYSEY'S Private Journal when attached to the Trigonometrical Survey in Southern and Central India, No. II.

In Vol. XIII. of the Journal, p. 853, will be found the first of these papers, though in point of time the last. The Editor now proposes to complete the series much of which, in connection with the papers published by the late lamented Captain Newbold, will be found of great interest and importance in our present scanty knowledge of the geology of these extensive districts.—Ed.

*Extract from D. H.'s Manuscript.**

The mountainous tracts of which this Peninsula is composed, consist chiefly of primitive formations of which the old trap with all its subordinates is the principal.

The hills in general do not rise to any great perpendicular height, few are higher than 5000 feet and most only 1000 to 1500, and those close to the sea 5 to 600 feet.

The country south of the Krishna may be divided into the *eastern coast*, the *table-land*, and the *Malabar coast*.

The trap formation including the older, later and newest, is the most common, producing gold, diamonds, &c.

The coast between the sea and the mountains is low, although one occasionally meets with slight elevations of 50 or 100 feet.

The general ascent is indeed so trifling that although the ghauts are from 50 to 80 miles from the sea, their feet are seldom elevated more

* It is not now known who this gentleman was, but Dr. Voysey, had evidently found this general sketch worth notice and the Editor has thus inserted it also.

than a few feet above it, this has been determined by actual measurement in the Godavcry, Krishna and Cavery.

On the coast of Coromandel the first stratum which meets the eye is a moveable sand, interspersed with black particles of magnetic ironstone, common about Madras and sold in the Bazars under the name of Suranmmely.

Next is found a stiff loam very sterile, extending 2 miles inland, when other alluvia, such as sand, marl, disintegrated calc tuff, and a mixture of sienitic gravel, are seen in alternating strata.

The calc tuff is generally covered by a thick stratum of rich black mould, which appears to proceed from the quick destruction of the vegetables by the calc tuff. The marl is often 20 feet deep, and does not contain animal remains of any kind; rolled hornstoue, fragments of sienite and pebbles are found in it. It very often covers the stratum in which the diamond is found.

The acclivities which are found along the coast about Madras and Nellore consist of iron clay used for bricks, Dr. B.'s laterite. The small pebbles or stones in it, resemble floetz greenstone: mica is also found near Pondicherry, and a secoudary floetz lime with shells used for paving the streets.

In the vicinity near the sea are found remarkable petrifications of large pieces of trunks and brauches of tamarind wood.

Transition limestone is met with in some abundance, and in mountain masses near the Krishna at Clintapally. It might be taken for floetz limestone, but there are animal remains in it. Calc tuff and sienite are found, and a black limestone which burns white. About Lat. $13^{\circ} 14'$ N. mountains of transition flinty slate make their appearance 3000 feet above the level of the sea. The Pulicat hills.—They run in uninterrupted ranges from about 15 to 20 miles in the direction of the coast. The hill on which the Tripety Pagoda stands belongs to this rock and it further continues to the banks of the Pennar.

In the branch, south of Cuddappah which runs nearly east and west, I found small veins of plumbago. Sulphuret of lead with a large proportion of silver is found, 15 miles in a N. E. direction.

The flinty slate appears to rest on greenstone slate, which often makes its appearance in the Pallams, the Pulicat hills, and to the northward.

The hills at Vellore and the big and little Mount at Madras, are mostly transition trap.

They consist of a friable mixture of hornblende, felspar, quartz, and mica, with garnets and pyrope with epidote. The hornblende is found in the hills in nodules in concentric layers like basalt.

Under and among these hills, rocks of the old trap rise often in high ranges with acute points. Felspar, hornblende and quartz with a small proportion of mica, pyrope and epidote enter it as foreign minerals. When the latter, particularly garnet, are absent the felspar is red. Of this rock, the generality of the hills on this coast consist. It seems to rest on granite near the seven pagodas: a rare occurrence, the appearance of the granite along the coast. The granite is particularly striking here on account of its freshness, whilst the former is found tarnishing and scaly.

The hornblende which forms a constituent of our primitive trap is in general shining black, and contains iron in so great a quantity as to be attracted by the magnet when in small particles. It is the same in the greenstone and greenstone slate on which the transition flinty slate of the Pulicat hills rests. The greenstone of that part of the country exposed to the air becomes green, although it is black, and does not contain a particle of copper.

The brown and hydrous copper of Dr. T. is found here and in some places mica slate with large garnets.

A compact greenstone, foliated and ringing when struck, is used for lingams. Common hornblende of an olive-green is found in the Bara-maul in Noorcull, in primitive trap with garnets. A remarkable rock called *black granite* procured near Madras, is common augite rock. It occurs only massive, greenish black, opaque; in small thin pieces, and on the edges in large pieces, olive-green and transparent. Internal lustre resinous, glistening and splendid; fracture foliated and granular and on the whole uneven. A two fold cleavage is observable, it is semi-hard, rather brittle, easily frangible, Sp. Gra. 3. 20. garnets are found in it and basalt. If the latter indistinct grains of a black colour, foliated fracture and less hard than the augite; the former are of a ruby colour.

Another stone found in this part of the country (Madras), I will call compact hornblende, although it differs in many respects from that rock.

Its colour is Olive green with a lighter greenish grey streak ; fracture granularly foliated, opaque ; lustre glistening on the foliations, for the rest dull. Semi-hard, rather brittle, but difficultly frangible ; fragments wedge shaped sp. G. 3. 53. It is perhaps a species of common actinolite.

The Corundum is found frequently in rocks of the old trap formation. The iron which is found accompanying it is common black hornblende. Corundum in rolled pieces occurs in alluvial strata along with the diamond, epidote, greenstone &c.

Among the trap rocks in the southern Baramahl, I have often met with several pieces of actinolite ; and near Salem and Namcull in kidneys, native magnesia accompanied with figure stone or agalmatolite.

Of iron ores. I have only found on the coast the common iron sand in the beds of rivers and some swamp ores in the low country.

Besides the abovementioned trap the old clay slate (?) formation occurs and mica slate. The former about the Krishna under transition limestone also with flinty slate on one side and primitive on the other.

Mica slate I have discovered under the greenstone slate near the copper mines.

Extracts from Dr. Voysey's Private Journal.

Friday, 18th November, 1818.—Quitted Paramboor at 11 o'clock, and arrived at the Red hills half past 12. Barometer yesterday at 2 o'clock, 768 m. Ther. 78° : to-day at 2 o'clock same, Ther. 81°. Irregular appearance of the iron clay, sometimes containing large pieces of brown ironstone, but for the most part small, with a considerable quantity of magnetic iron ore. Iron clay formation continues, although covered with a thick bed of sand.

Monday, 16th November, 1818.—The iron clay still continues, but we now and then meet with lumps of quartz and quartz rock, brought to mend the tanks and roads.

Tuesday, 17th November, 1818.—Swam across a considerable stream and found on the banks lumps of fullers' earth lying on a quartz sand intermixed with bits of quartz.

Wednesday, 18th November, 1818.—On the borders of a tank I found a very considerable quantity of the pyriform brown iron stone,

which I also found at intervals all the way to Nyour Choultry, in the neighbourhood of which it is found in large quantity. The iron clay was frequently seen throughout the journey, sometimes containing both large and small pieces and blocks of quartz. On approach to the Choultry we observed a number of smiths at work. The forge and bellows of the usual rude construction; the iron ore is brought from the neighbouring hills: these hills are continuous with those of Naggery Nose Worramallepett, and appear to be of the same composition; granite at bottom and sandstone at top.

The ore is the slaty red iron ore of mineralogists, and produces tolerable iron. In the neighbouring jungle, several large blocks of granite were visible peeping through the iron clay: in one place containing large specks of black mica, the stratification not real, since it was not continuous. The iron clay exactly resembles that of Midnapoor, containing brown red hematite and quartz. The granite resembles that of Cornwall with more mica, making it somewhat darker. The most remarkable plants are *Euphorbia antiquorum*, *Asclepias aphylla*, *Cassia auriculata*, *Gloriosa superba*. The extent of the iron clay formation, is well worthy of consideration, and I regret much that my mode of travelling does not allow me to pay more attention to its connexion with other rocks, as yet I have only seen it with granite, upon which it is directly laid.

The water of the tank at this Choultry, built of granite, is very pure and contains very little muriate of soda. I brought from thence marked No. 1, granite, iron clay, and red iron stone brought from the hill of Goondum or Mokush; my information was obtained from the Brahmin of Nyarpet.

Thursday, 19th November, 1818.—A short time after quitting the Chouvadi early in the morning, I observed clay slate coming out in the road, which was strewed for a considerable distance with large pieces of quartz and the iron clay. On examining the water of the tank, I detected sulphate of lime in considerable quantity as well as muriate of soda. I observed lumps of greenish blue clay slate in the village, said to come from the neighbouring hills; the commencement of the Venkatagerry range.

Friday, 20th November, 1818.—I observed granite coming to-day within a few yards of the Choultry, and in another place a large quantity

of flesh-colored felspar in blocks with stripes and lumps of quartz, also mica slate and granite, with a large quantity of green hornblende,* the decomposition of the hornblende leaves a greenish yellow clay very plastic; my time was so short that I was not able to search for the junction of the primary rocks with the iron clay. The heavy rain prevented me from opening the Palanqueen, so that I lost the termination of it. I saw it for the last time about 3 coss from Nyarpet.

Saturday, 21st November, 1818.—Just after quitting Goodoor, I observed large masses of granite cropping out, with a very large proportion of white felspar: during the day large pieces of quartz, sandstone, and iron clay were strewn along the road, but no rocks visible. In the neighbourhood of this village Venkatachellum, there are large masses and the tanks are built of the latter.

Sunday, 22nd November, 1818.—Nellore a long dirty town, built on, and partly of, the iron clay, which is here to be seen in an imperfect sort of stratification or rather seams which are neither parallel nor horizontal. I saw a well, 20 or 30 feet deep dug through the iron clay, which resembles very nearly those specimens presented to Mr. R. by Col. M. said to come from Mysore.

Monday, 23d November, 1818.—Paid a visit to Mr. Sutton at 12 o'clock, and went with him to see the quarries of iron clay. In one place over a stratum of it, the mould was upwards of fifteen feet in thickness and in others less.

I observed pieces of brick and pottery, close to the surface of the clay in the vegetable mould. An antique figure of Buddha built into the masonry that forms the foundation of Mr. Lord's house near the quarries, has a very picturesque appearance. I also visited the iron clay in the banks of the Pennar, where it is seen on the right bank in great abundance: the bed of the river, which is very much choked up by alluvium, and therefore much higher than when the pagoda was built on its banks, is now effecting serious breaches in the wall surrounding it, as well as in a little temple or Chauvadi built on an elevated portion of the iron clay. The alluvium of the Pennar is entirely silicious, mixed with a few shells. I bathed, and found the water, where we crossed, brackish. The iron clay of this neighbourhood contains more cellular cavities and more brown hematite than I have hitherto

* Epidote? undetermined.

seen. The neighbouring hills contain abundance of granite intermixed with hornblende, which I saw in a large piece near the tank.

Wednesday, 25th November, 1818.—We passed a tank built of the iron clay, which was however, entirely grass grown, as well as its banks, and surrounded by ancient granite statues of Siva, having a most romantic appearance, from its evidently great antiquity, and its remoteness from any habitation or temples. The soil and appearance of the country differs greatly from that on the other side of the Pennar, being very silicious. The Mango topes are in great abundance, and a greater extent of land is in cultivation.

Friday, 27th November, 1818.—Quitted Mawildroog for Ramahpattam, the sandy soil and shells betoken our near approach to the sea.

Saturday, 28th November, 1818.—On the hill is a temple in ruins, dedicated to the worship of Jagannath, built of iron clay and primitive greenstone; some images and inscriptions on the latter are very little defaced. A name of Vishnu, Balaram his brother, Shabudra his sister. The hill consists of iron clay and is about a mile in circumference, of an oblong form completely insulated. On the hill I found bits of mica slate, and primitive greenstone, with quartz rock and brown ironstone; but I was told they were all brought from a hill six coss distant. I cannot sufficiently regret my inability to observe the junction of the iron clay with the primitive rocks. The same magnetic ironstone is to be found here as at the red hills; I ascended the hill thrice during my twelve hours' stay.

Monday, 30th November, 1818.—The basis of the hill is granite with a considerable proportion of hornblende stratified; the strata dipping to the south at an angle of 90 and running east and west. On the summit the brown ironstone was pure, but lower down it was intermixed with quartz in considerable quantity. Thermometer 80°. Magnetic iron ore in considerable quantity; also veins of graphic granite: at the foot I picked up some primitive greenstone but saw none on the hill. I counted about 40 eminences of nearly a conical form in the large plain, about 20 miles in diameter. N. B. The ironstone appeared to be on the granite in an unconformable position. I observed the *Nepeta Amboinica*, *sea Indica* in great profusion on the summit of the mountain. At the top I saw the sea at a distance of eight miles. The whole country between this place and Ongole appeared to be an alluvial clay mixed

with small pieces of granite, greenstone, blue clay slate, and calc tuff mixed with clay.

Yellumpilly, Tuesday, 1st December, 1818.—The soil of the road and its neighbourhood was a rich black mould, tolerably stiff and retentive of moisture, and appeared to be the result of the decomposition of the primitive trap rock, of which the adjoining hills consist; we came to their feet or rather passed the end of the chain about eight miles from Yellumpilly. I ascended about 100 feet and found them to consist of vertical strata of trap, composed principally of hornblende in large crystals with a little felspar, with veins of hyaline quartz, and of granite containing garnets and very brilliant felspar; also large masses of a compound of what I shall call at present common schorl and grenatite, though in appearance very like. The vein of granite containing the garnets projected beyond the other strata, shewing less facility of decomposition. I saw also brown greenstone. Farther on in the road, we passed over granite and gneiss in vertical strata; the upper stratum consisting of calc tuff in a clayey loam. The variety of minerals, plants, insects, birds, &c. seen through this short march is truly astonishing and I unceasingly regretted my rapid passage through so many novelties.

Thursday, 3rd December, 1818.—I ascended a hill two miles from the Chauwadi, and found primitive greenstone in vertical strata, with veins of grauite and brown ironstone: the direction S. E. The soil and cultivation as yesterday: about 10 it commenced raining and continued through the day, preventing me from making any examination of the interesting hills we passed. They appeared to consist of vertical greenstone, mostly conical, some small ones castellated and quite destitute of herbage, the former being but thinly covered. At one time I could count at least 40 of these conical hills, sometimes connected with each other by a low chain, at others quite isolated. In the plain at intervals we passed over the black mould, at others over beds of calc tuff and decomposing greenstone.

Friday, 4th December, 1818.—Our road to Repurlah lay through mountains of the same description as yesterday, greenstone slate in which were beds of quartz. On the road lay calc tuff with pieces of greenstone cemented in it. The calc tuff contains a considerable quantity of argil, and here and there small crystals of quartz. I was

not near enough to any of the hills to ascend, if I had time; when we had performed half our march the rice fields made their appearance, and the road was strewn with bits of a conglomerate very much resembling the iron clay, but consisting of carbonate of lime and ferruginous clay; now and then in the road and in the beds of nullahs highly inclined strata of gneiss and greenstone slate made their appearance. In a little temple built in honor of Hunooman, and in which there was his figure in basso-relievo, the portico was built of a beautiful sienitic granite, the hornblende nearly micaceous, being arranged in stripes with great regularity; my piety prevented me from robbing it of a bit for my cabinet. The face of the country now changed, and the numerous conical hills began gradually to disappear as we left them behind us, and at the end of the long plain before us appeared a chain of hills running N. E., as far as we could see; their shape angular and slightly peaked, altogether different in their general aspect from those we had quitted. I took the height of the Bar. exactly at 12, but discovered that the Calcutta workman had unfortunately neglected to solder the tube, which had shifted its place and totally altered the measure. Thermometer 82°.

Saturday, 5th December, 1818.—The heat and other occupations prevented me from going out until the evening, when I ascended the hill on which a small pagoda is built, due west from the Chauvadi, the steps, in number about 50, were formed of large slabs of clay slate; quartz rock was scattered about in very large masses; the pagoda was built principally of greenstone and schistose limestone, the rock surrounding it and on which it was built, was quartz rock coloured by iron, with veins of brown ironstone.

Sunday, 6th December, 1818.—In consequence of a halt, I rose this morning very early for the purpose of visiting once more the hill and pagoda. I found the whole to consist of quartz rock strongly impregnated with iron, except that in some places, it consisted of a white quartz in large blocks; that which was impregnated with iron had veins of brown ironstone running through it, principally in N. E. direction. The limestone and greenstone as well as clay slate come from hills about two coss nearly due west of the village.

Monday, 7th December, 1818.—The quartz rock continued for some miles from Nacricull, and we there saw a slaty limestone crossing

our path, which continued to appear from time to time until we were past Peddurgall. I afterwards saw large blocks of granite containing epidote; I could not however trace any connexion between the two rocks. The limestone appeared at times in vertical strata and at others nearly horizontal; it is not at all crystalline, and contains a considerable quantity of argil.

Tuesday, 8th December, 1818.—At Dachapilly, on our road to the Kistna, the horizontal limestone, or at least nearly so, made its appearance in great abundance; all the houses and walls of the gardens were built of it. In a pagoda I saw large blocks at least five feet by three. At this place it was to be seen of all colours from a very white semi-crystalline to a black colour. On our road after quitting Dachapilly, it alternated with the argillaceous calc tuff; about four miles from Dachapilly it was seen in great quantity of a dark black colour (compact Lucillite of Jameson), and on our approach to Pondegul it was covered by large and small rounded masses of quartz rock in considerable quantity. When on the bank of the Kistna, it was horizontal and of all colours, zoned, and with a substance intervening between the strata sometimes white and fibrous like tremolite, at others like red and black ironstone; sometimes containing small nodules of red ironstone, and in one instance, from a specimen I found in the bed of the river, green quartz.

Two furlongs above, and one below our present station, are found in the bed of the Kistna, large and small rounded pebbles of granular quartz rock, jasper with quartz and micaceous iron ore interspersed in it. The strata on the bank for at least fifty feet, have sunk in a very abrupt manner, I should suppose, from the gradual undermining of the river which is rapid and very full in the rainy season: it brings with it vast quantities of mud, which it deposits at the sides on the limestone, and thus marks its height. The river is about the breadth of the Thames at Battersea, and becomes suddenly very deep. The extent of this limestone formation, which is the compact limestone of Jameson, and although a secondary formation would form a very handsome polished marble, is very considerable; I first saw it at Nacricull, distant about thirty miles. It appears unfavourable to vegetation as in the jungle we saw nothing but two species of Euphorbia, and some hardy leguminous plants; I have as yet searched in vain for petrifications.

Wednesday, 9th December, 1818.—This morning I walked for some distance by the river side and on the bank above it ; here I found the calc tuff in abundance containing rounded pieces of quartz, &c. exactly similar to those found on the river side. It is more than probable therefore, that these were once enveloped in the same substance, which being decomposed the stones contained in it were either carried down to the river or left on the surface of the limestone ; the stratum of calc tuff must, however, have been of little thickness originally or more of it would have remained. I observed the same on this side of the river (Warripilly), which we crossed this morning in round boats of wicker covered externally with leather, and took possession of a large Caravan-serai or Musjeed. We strolled after to the ruins of a large pagoda built of the limestone and with very large blocks, some of which were 10 feet in length ; it appeared to be attached to a large palace or building surrounded formerly by an extensive wall : in the pagoda were images of Siva and a lingam : the only information we could obtain from a brahmin respecting it, was that it was built by a Hindu rájá many years ago, and was no longer used for worship, having been defiled. All round it were immense masses of the limestone completely denuded of all earthy covering. The walls were built of two solid pieces of stone placed on their edges, leaving a wide intervening space, so that on the outside they appeared 10 or 12 feet thick.

Thursday, 10th December, 1818.—Quitted Warripilly very early, so that I could not see the termination of the limestone. When we quitted Goonderpour where we breakfasted, I observed large blocks of granite strewed in every direction ; this continued for a considerable distance, perhaps three or four miles, when irregular lumps of a primitive greenstone appeared among them ; I perceived the calc tuff in small pieces, but could not ascertain if it existed in any quantity or whether brought there by accident : after a furlong the granite again ; to-day in large masses, in one place an isolated block 20 feet in height and 30 in circumference. At this place the Musjeed and part of the fort is built of it. It is of a white colour, a large proportion of felspar and little mica, quartz moderately abounding : I observed no hornblende in it.

Friday, 11th December, 1818.—I saw by moon-light some precipitous rocks of no great height and at a short distance from the road ;

they had the rounded appearance of granitic blocks : at sunrise at a short distance from Teeperty, I saw the granite again, and found on my arrival the principal edifices partly built of it : it is highly crystalline and rather large grained. Strolling to the westward about five hundred yards from the town, I fell in with a large surface, not rising above ten feet from the ground, in an irregular manner, and extending about 100 by 50 feet wide, containing in it rounded and angular masses of a crystalline micaceous greenstone, which I presume the most superficial observer would consider as having been inclosed in the granite, when the latter was in a fluid state. I procured specimens of both granite and greenstone, but could not get at one which shewed their union.

Qy. How high has the iron clay been observed ? At Cape G. H. very little above the level of the sea, and there covered by the sand flood ; on the coast of Coromandel the highest I have seen about 100 feet ; also what connexion with the calc tuff if they may not be traced passing one into the other ?

Saturday, 12th December, 1818.—Immense blocks of granite all the way to Nelgondah, scattered without order throughout an extensive plain sometimes rising into hills of various sizes.

Nelgondah is situated between two very large and lofty hills consisting entirely of granite, sometimes white, reddish and black, containing veins of quartz of small size, and without any beds of other rocks as far as I could observe, my time being short ; the plain reminded me of that in the neighbourhood of Ongole from the numerous unconnected hills and mountain masses.

Sunday, 13th December, 1818.—The granite rock which we ascended yesterday, and which we found so precipitous on its southern face, was continued in a lengthened declivity for a mile and a half, between Nelgondah and Mungoor. We saw rocks of granite scattered in every direction, and on the surface of those near the road, the calc tuff made its appearance, and from its decomposition gave the thin crust of soil on the surface a red colour ; small pieces of greenstone were now and then seen, but no rocks.

Tuesday, 15th December, 1818.—I quitted Narrampet yesterday at three in the afternoon and passed through a beautiful vale between two lofty ridges of granitic hills : at their feet I saw greenstone in abundance.

I also saw a bed of a substance in specific gravity, hardness and fracture, much resembling corundum excepting colour which was green.

Monday, 21st December, 1818.—Facts in illustration of the history of iron clay formation, belonging according to Werner to the floetz trap.

1st. Its extensive diffusion,—Carnatic, Malabar Coast, Orissa, and Midnapore.

2d. Small elevation above the level of the sea.

3d. Connection in the Carnatic with primary rocks, Concan, Malabar.

4th. Its being apparently confined to the coast or extending only a short distance inland.

Saturday, 9th January, 1819.—I quitted the cantonment, Secundrabad, at three o'clock. I met Major Hopkinson at the bund of the tank, who was making or repairing the road destroyed by the overflow of last season; he was in the act of directing the removal of a large block of the greenstone; he told me that the vein was continued beyond the tank in a northerly direction, but that it could not be traced farther south; also that the large vein crossing the road to the residency, was continued in the same direction to Hyautnuggur 12 miles distant. He mentioned the singular discovery of cairns and druidical circles by W. P. of the Artillery; one of them had been opened lately of a curious formation and several bones had been found in it. The granite continues to wear exactly the same aspect here and on the road we have travelled from Secundrabad, the loggan stones and tors being very numerous.

Sunday, 10th January, 1819.—Halted the whole day at Chinchawalee ka Durga, and in the afternoon visited the tombs of Golconda; large cupolas supported on square pilasters of granite of an extraordinary length, some of them were at least 20 feet high, of solid stone. The tomb is in the centre of the hall, formed by the cupola and is made of greenstone. Of this stone we discovered a vein about 10 feet wide and running east by south, the same direction as those in Hydrabad: the sides were composed of granite intermixed with the greenstone which affected the form of rhomboidal blocks, and was penetrated by quartz veins. From the top of one of the tombs we had a very fine view of the fort of Golconda, which is

not so strong as it is supposed to be. Granite. No diamonds. The characteristics of this country and striking ones they are : loggan stones and tors of the most grotesque appearance, generally smaller than their support or pediment, and in many instances piled together by threes ; their origin I shall hereafter speak of :—tanks of large dimensions varying from twenty to thirty miles in circumference, formed by dividing the bed of a natural lake formed during the rains, into two parts by a large mound or bund, through which several locks suffer the water to escape as it is wanted to fertilize the other half of the bed, converted into paddy fields :—the trap or greenstone running twenty miles E. by S. of which I have seen three miles ; this stone is used for lingams and gods by the Hindus, and for tombs by the Mahomedans.

Monday, 11th January, 1819.—We travelled through a country similar in all respects to the one we had quitted, except that the granite tors assumed a still more grotesque appearance as we advanced, until within two miles of Puttuncheroo, when the granite suddenly ceased to be visible and a fine plain of alluvial soil was spread out before us covered with trees and bearing the strongest proofs of great capability for cultivation.

Tuesday, 12th January, 1819.—The country between Puttuncheroo and Begumpett, on which the village is built, consisted of the same fertile soil and plain, bounded on the east and west by low granite hills still preserving their peculiar features, when on our arrival at Begumpett the granite suddenly reappeared in our path and formed the hill on which it stands. On descending we found a stiff bluish clay which continued to the place of our encampment Susdanuggur, on the borders of a tank.

Wednesday, 13th January, 1819.—We travelled through the same plain ; low granite hills making their appearance until we nearly reached Wondole, when quartz rock forming considerable elevations running in a N. and S. direction ; this rock continued for a mile and a half, and then disappeared two or three hundred yards from Jogypett, the place of our encampment. There the rock rises highest, perhaps 50 feet. The quartz appears to have been once covered by an iron clay deposit from the quantity of pisiform iron ore found on it and from that formation being found in the ravines and rents at the sides and bottom of the hills.

Thursday, 14th January, 1819.—We passed through Jogypett, and crossed a plain about 7 miles in breadth, between the quartz rock and the hill on which Col. Hampton's flag was fixed; the sides were covered with angular and rounded masses of a rapidly decomposing greenstone or hornblende rock, on breaking which the grey colour of the decomposing surface was found extending into the black crystalline rock for about 2 lines. The soil formed by its decomposition was very rich and retentive of moisture. The form of the surrounding elevations was nearly similar and had nearly the same N. and S. direction. The stone had no perceptible effect on the magnet.

Monday, 18th January, 1819.—We quitted Tadmanoo for Jogypett: I had a better opportunity of observing the scattered lumps and masses of granite, which are strewed without order on the plain at the foot of the quartz rock. I observed no difference in its structure from that of Hyderabad. On descending the hill I passed just before the sun rose, through a stratum of air in which the evaporation was rapidly going on, producing a very cold sensation; when I came to the bottom, as I had gone faster than to allow the inferior stratum to be affected by the same cause, the warmth was very agreeable, but as I could go no lower it speedily became cold as before, until the sun rose and counteracted the effect of the evaporation. I forgot to observe that the quartz rock is crystallized in rhombs, some of the angles of which are very perfect.

Tuesday, (Mungul) 19th January, 1819.—We crossed the quartz rock which is not above three hundred yards in breadth and on descending into the plain watered by the large tank of Jogypett, soon met with lumps and masses of granite, which gradually increased to the river Manjira, of which it formed the banks: on crossing the river, now about its medium height, we observed with surprise veins of white granite passing through the syenitic granite, which forms its banks. The rock containing these veins is much more susceptible of decomposition from the hornblende which it contains, than the veins of red and white granite, and the appearance produced, was like a fret work, when the broad surface of the rock was exposed; when an edge was left to the action of the atmosphere it was in small diagonal ridges.

This formation appeared confined to a space of a few hundred yards only on the right bank of the river.

It is worthy of remark that this river after we crossed it at Begum-pett, takes a considerable turn to the N. and that its bed no longer contains calcedonies there found in it. The mud however is the same, and appears to be that arising from the decomposition of the trap rock of Tadmanoor and elsewhere. After passing some elevated minor granitic hills, we pitched our tents on the borders of a lake at the foot of the station Suldapoorum.

Wednesday, 20th January, 1819.—The mixture of granite and syenitic granite extends to this place, as I observed masses of the syenitic granite imbedded in the former near my door, it reminds me of the same appearance at Teeperty, near Neelgondah; as I have specimens, I shall have an opportunity of comparing them.

Thursday, 21st January, 1819.—About halfway up, the blocks of granite disappeared, and the path presented the decomposing trap rock of nearly the same nature with that of Tadmanoor hill, its decomposition forms the same rich soil as on that hill; I found amongst it specimens of a substance intermediate between heliotrope and hornstone. From the top I counted 33 lakes and should have counted more had the horizon been clear, the hill is not above two hundred feet in height, my barometer fell $\frac{2}{10}$ inch. The neighbouring mountains were slightly elevated above us and their direction and form nearly that of the one we were on, N. and S. and round backed, with two or three slightly conical and more elevated summits in the range; in one instance a range of low hills appeared to cross diagonally, indeed the direction of all was very indistinct and most commonly curvilinear.

Friday, 22nd January, 1819.—For several miles after quitting Suldapoorum, I passed through a beautiful forest of Teak, Mango, Ficus iudica, Tamarind, and other fine trees and shrubs mostly leguminous; the soil was partly granite and partly decomposing greenstone, but wherever rocks were visible they were invariably grauitic. At a small village situated on an immense divided mass of granite a trap vein (primitive greenstone) crossed my road, running east by south; another about two miles farther became visible, of larger dimensions and was lost in the jungle, in a short time we were surrounded by granitic rocks with the same features which distinguish those of Hyderabad; huge masses with a concentric lamellar structure, loggan stones, tors, &c., but with a large quantity of detritus at the feet.

In the alluvium at the foot of the pass to Chittial, was found a large breccia containing handsome specimens of amethyst quartz accompanied by quartz and cemented together by a silicious sand, strongly impregnated with iron.

Sunday, 24th January, 1819.—I gained the top of the hill after breakfast, and on my way found a considerable quantity of earthy-brown and red ironstone lying scattered in the ravines and in the spaces between the granite rocks, I had no means of judging whether it formerly belonged to any formation such as the iron clay, but it certainly resembled that found in it.

Monday, 25th January, 1819.—The ranges of hills appear to run principally N. and S. from to the east of north. As I descended I found a substance resembling calc tuff, in quartz, in a ravine, lying on the surface and apparently brought down by the rain from higher ground. I rode to Maidurh and round the hill on which the fort is seated: it resembled very much that of Golcondah: I passed a river running from west to east and some strange tors and loggan stones.

Tuesday, 26th January, 1819.—The road lay this day through a tolerably rich country, whose soil was of the black argillaceous kind arising from the decomposition of the transition trap: although on advancing, without apparently changing our level we met with the old granitic sandy soil, which is that of Ringumpett; and in its neighbourhood, where our tents are pitched, is a large grained granite with very handsome bluish grey felspar. I forgot to observe that the forms of the granitic rocks were more varied than I had yet seen them, forming every description of loggan stone and tors that can be conceived.

Wednesday, 27th January, 1819.—The soil alternated from the black cotton soil, as it is called, to the sandy granitic, and the only rocks we saw in this extensive plain were granitic in small lumps and masses. As we approached the river Manjira, they were profusely spread on its banks and in the middle of its stream; here and there in its bed we observed small pieces of calcedony and cornelian. About three miles from our station Ringumpett, I observed a very small-grained reddish granite, much used in the buildings of the village.

Our station was on the transition greenstone, differing in no respect from that of Tandmanoor, the same black thirsty soil covered with the *Poa cynosuroides* (Kusa grass), also the *Semicarpus anacardium* and

Butea frondosa. At a lower part of the hill due east from the station, I observed in a stone different from any other I had previously seen, several turritulites and bivalves. The stone is of a bluish grey colour alternating from that to a blackish grey, containing transparent spots of stalactitic silica, its fracture is for the most conchoidal, even, with sharp edges; it is hard, easily frangible and specific gravity about 2.0. I have since found in another part of the hill nearly due north from the station, large nodules of corroded and vesicular flint, and masses of the former stone passing into flint; some of the masses were a foot and a half in diameter. I also in nearly the same direction from the station, at the distance of half a mile, saw the transition trap laid bare; it affected the columnar form and was every where split and divided without any appearance of stratification; in some cases I found on the surface concentric layers rapidly decomposing, enabling me to remove two of its coats.

Friday, 29th January, 1819.—I went this day to the southward and westward as I had previously been to the other quarters of the station. The cultivation has evidently extended all over the hill, fully accounting for the smallness of the shrubs and trees on it: ravines proceed in every direction from the top, forming in the rainy season large torrents, supplying the Manjira with the mud which it then deposits on its banks. In the lower grounds I saw wheat, cotton, ricinus, and linseed in cultivation and in flourishing crops. We had scarcely arrived at the bottom of the hill and about half a mile from the first village when the granite appeared in an abrupt part of the road: near its first appearance we found precisely the same mixture, which I have twice before noticed, viz. at the Manjira and Repurlah; near it was a bed of Meerschäum. The granite with its customary attendants in the shape of loggan stones and tors soon succeeded, with here and there masses of greenstone rolled and scattered without order. The jungle prevented me from tracing their origin. In the evening I visited the fort and saw at least a radius of 30 miles of the surrounding country: we were still in the vast plain, but now more broken in upon and diversified with rocks of granite. This is now redder and contains veins of a still redder granite. It has also less of the appearance of concentric layers and has a more stratified look. The fort is miserably dilapidated, we were admitted without the least cere-

mony. The country appears destitute of springs and depends entirely on the rainy season and a few rivers for its supply of water.

Sunday, 31st January, 1819.—In the evening I observed in the banks of a small nullah, dry in most parts and containing only a muddy water tasteless of any saline impregnation, an incrustation of carbonate of potash from and apparently by the decomposition of the felspar of the alluvial* granite of which its sides were composed, acidified by the atmosphere.

Monday, 1st February, 1819.—A short march from Sauhrampett to Bachapilly; the granite continues to be red and of a small grain; about half way a vein of greenstone passed the road. After breakfast I ascended the hill which has a fine prospect in a southerly view bounded by a range of hills running east and west; their outline was rather different from those I have been amongst for some time past, being more peaked,—the Manjira taking a N. W. direction is in the plain between. The mountain or rather hill of Bachapilly is almost insulated and may be seen on all sides at several miles distance although not 200 feet in height. It consists almost entirely of granite in large irregular masses piled one on the other without order.

Tuesday, 2nd February, 1819.—I left Bachapilly this morning for the river Manjira, its nearest approach being about 4 miles E. S. E. of the hill. The road lay through jungle with heaps of granite at intervals in hillocks, and irregularly strewed over the ground; 2 miles from the encampment the road was crossed by a primitive greenstone vein taking its usual direction. On arriving at the river I found its banks and bed lined and filled with granite: on the right bank the black alluvium was thirty feet above the level and perfectly horizontal on the top: the bed consisted of granitic sand, a few pieces of calcedony not very frequent, and a few shells of the same species I had previously found on crossing it first.

I should have observed that I saw magnetic iron sand mixed with the mud on the bank of the river. Also in a stream which emptied itself into the river, a trace of the efflorescence of carbonate of potash. Our encampment is not above the level of the banks of the river, there being no difference in the barometer observed at each place.

Wednesday, 3rd February, 1819.—The hills have no regular course or direction, one of the proofs of which is that the river runs in the midst of them.

* So in original: *diluvial* is probably intended.—EDS.

Thursday, 4th February, 1819.—I saw also near the village of Bachapilly some singular veins of granite rising through a greenstone or syenitic greenstone, very similar to what I had before observed on the banks of the Manjira : the veins having resisted decomposition much better than the containing rock remained projecting two feet in some instances : it is remarkable that a shift of the veins had taken place : the granite vein was sometimes white and sometimes red like that at the Manjira, the course of what we could discern of this formation, which lay in a field formerly in cultivation and over which the jungle was spreading, was east by south. Visited the Bears rocks, a granitic elevation of thirty feet, distant east by south from the station about 400 yards. Its base consists of a large grain containing red felspar, white compact ditto, and hornblende, forming altogether a beautiful stone ; through this mass, a vein of syenitic greenstone differing in width from three feet to a few inches, runs for about fifty feet ; this is again crossed by veins of a finer granite nearly resembling that higher up, which is in large blocks apparently placed without order, but an eye accustomed to these rocky elevations, almost peculiar to this country, discerns in these masses the remains of a concentric coat of granite. The remains of strata filled with these granitic veins are very common between.

Friday, 5th February, 1819.—On our road through the plain the same kind of granite to which we had been so long accustomed was frequently seen in irregular masses, two miles from Bachapilly we crossed a small nullah running in the direction of the Manjira. Immediately before entering Polelum a large deposit of quartz rock running E. and W. about half a mile, resting on granite. It was of the same description as that at Joggypett : our road then lay through a plain of black cotton soil, when after a tedious journey through a thick jungle in which nothing was to be seen except masses of granite, and now and then lumps of greenstone, we began to ascend a hill composed of greenstone, having the same characteristics as that of Tandmaoor, containing foliated zeolite in abundance and calcedony lying loose in the ravines, and on its surface high kusa grass (*Poa cynosuroides*).

Sunday, 7th February, 1819.—I quitted the hill with Everest early to go to Kowlass, we descended one of the ravines so common on these hills and soon came to the usual kind of granite, but could not observe

the junction of the strata ; we again began to ascend by a very long road, until the junction between the trap and granite was very distinct, and on looking around us each of the numerous elevations in sight appeared covered with the same kind of trap resting on granite. It is worthy of remark that many trees on the hill are destitute of leaves, whereas in the vallies and ravines they appear to preserve them late in the season. We now began to ascend the hill on which the fort of Kowlass stands, in which there is nothing externally different from that of Medenkah Golcondah ; the fort and basis of the hill are of granite both red large-grained, and grey small-grained ; on its northern side and near the summit a very considerable vein of greenstone crosses the path running E. S. E. and W. N. W., its northern or upper edge is well defined and consists of greenstone porphyry, containing both crystals of felspar and smoky quartz in the upper part of the vein, but lower down the hill, the stone is a coarse greenstone very subject to decomposition which takes place in a concentric manner and very similar to that of the hill of Boorgapilly, which is more secondary and contains zeolites ; its lower edge is less well defined and instead of being bounded by the granite as on the other side, it is spread for several yards over the granite, lying directly upon it : the breadth of the whole is from about 40 to 50 feet ; its length we had it not in our power to ascertain. After my return I visited the village of Boorgapilly, the environs of which consist of a very rich soil formed by the decomposition of the trap ; in which soil, where it has not been disturbed, the zeolite has been re-crystallized in silvery plates.

Wednesday, 10th February, 1819.—We crossed a nullah after descending the hill of Kowlass, running east to Manjira. We passed through a large plain of the black cotton soil and arrived at Beechicondah, through a pass of granitic rocks, in which were many loggan stones, and angles were taken. I reduced the temperature of Fahrenheit from 88 to 59, at $\frac{1}{2}$ past three o'clock, P. M. The hill or hills are composed of red syenitic granite very similar to that at Bachapilly, though of a smaller grain. I had an opportunity of observing the communication between this plain and the one which it follows. The whole is flooded during the rainy season, and affords an easy explanation of the universal appearance of the black cotton soil except in the neighbourhood of those hills which are covered by granite alone.

We passed several little rivers on their way eastward to join the Manjira. An explanation of the cause of the total absence of trap on some of the hills must still be sought for.

Thursday, 11th February, 1819.—Through the continuation of the plain to which Beechicondah is the pass. For some distance granitic sandy soil, when a river produced its usual accompaniment the black cotton soil of the trap. We passed Mudnoor at the back of which to the N. E. the granite commences surmounted by the trap. As we crossed the fields and ascended the hills of Bukutapoor, calcedony with green-earth, heliotrope, amygdaloid wacke, with zeolite, stilbite, and carbonate of lime coloured green, were found in great abundance and very fine specimens.

The western side of the hill on which we are encamped is composed of the crystalline transition greenstone, but in the vallies and towards the eastern side it consists of wacke enclosing large specimens of foliated zeolite or stilbite with amygdaloidal pieces of green-earth, which has given its colour to carbonate of lime also contained in it. The wacke is of a greenish grey colour and is destitute of crystals of olivine or of basaltic horublende.

Friday, 12th February, 1819.—I visited a ravine about a mile due east of the hill, in which the trap was much water-worn. In one part it had very much the external appearance of the Rowley Rag Basalt described in Thomsou's Annals, being semicolumnar. In auother part, it consisted of nodular concentric masses of which the external coats were decomposed, leaving rings around a lump of more compact nature undecomposed, ou others a number of concentric circles visible of various sizes, according to the quantity of the mass decomposed.

Our servants have brought in a number of very handsome specimens of

- Wacke contg. Foliated zeolite.
- Ditto Green carth.
- Ditto Green carbonate of lime.
- Ditto Nodular mesotype, heliotrope.
- Ditto with green-earth and calcedouy.
- Ditto with Jasper ditto ditto.

Saturday, 13th February, 1819.—The surrounding hills and acclivities are of two descriptions. The lowest are of granite, are rugged,

consisting of masses heaped one on the other and of loggan stones. The lower are generally east and west, level at their tops, with now and then rounded summits terminating by rather an abrupt slope, and containing vallies having the appearance of the embrasures of a fortification ; I recollect seeing the above hills mentioned by Colonel Mackenzie in his journal. The basis of all these hills is granite, reddish and of a small grain.

Sunday, 14th February, 1819.—List of minerals found on the hill and in the neighbourhood of Bhutkahpoor, during a residence of four days there :—

Basis of the hill, granite of a reddish grey colour and small grain. Granite.

Greenstone, early contg.	Zeolite.
Wacke concentric.	foliated.
.. globular.	radiated.
.. amorphous.	Heliotrope.
.. cellular.	Carbonate of lime.
Amygdaloid, contg.	Green earth.
Zeolite.	Calcedony.
Carbonate of lime.	Quartz.
Green earth.	Cacholong.
Brown ditto.	Striped agate.
Calcedony.	

Thursday, 18th February, 1819.—We quitted Bhuktahpoor, at 4 o'clock this morning. I had employed the three preceding days in visiting various parts of the neighbourhood. I found three streams of water descending from the hill in different directions supplied by infiltration : the temperature of one was 10 degrees lower than that of the atmosphere which was 88°. The wacke was not very general and appeared only in beds of small extent, the general rock being an earthy greenstone with no crystals of any description. I found in all the sides of the streams the efflorescence of the carbonated alkali, and I am at a loss to determine, whether it proceeds from the soda of the zeolite or the potash of the green earth. A dense precipitate was occasioned in water from a spring in the neighbourhood of the camp by alum in powder. I arrived at Daigloor, a short time before sunrise ; about a mile distant I crossed a river, the bed of which was composed

of large blocks of red crystalline granite contained in a breccia composed of limestone cementing quartz and red felspar; the sand of the bed was similar to that of most other rivers that I have seen, taking their rise from the trap hills and flowing through granite country; consisting of the debris of those two rocks as well as calcedonies and land shells of three sorts, buccinum, helix and pusilla, the right bank of the river resembled exactly that at Ramaledhypett, being lofty and composed of the black cotton soil. I passed over other ranges of the trap, of low height, until our descent into the plain through which the Mubnar passes, the right bank of which is also very steep.

At Adainaor the granite for more than one-half the height of the hill, and covered at the top by a very compact greenstone with crystals of felspar, and a few cavities not filled with any substance. The course of these trap hills was very distinctly seen from this point due E. and W.



Notes on the Zinc Mines of Jáwar, by Captain J. C. BROOKE, Mewar Bheel Corps.

I have forwarded to your address by dawk banghy a box containing specimens of ore, and of the metal extracted therefrom, found between Kherwára and Udyapura, and shall feel much obliged by your procuring me an analysis of the same, and information as to the composition of the metal* and the best method of smelting the ore. As a description of the place where it is found may prove interesting, I send you a few notes concerning it, and the little information I have been able to obtain of the former methods of working the mines.

2nd. The hilly country of Méwar has always been known to abound in metalliferous ores, and it is supposed that the produce resulting therefrom was one of the sources of wealth, by which former Ránás of Udyapura, were enabled to contend successfully for so many years against the might and power of the Delhi emperors. The most celebrated of these mines and which were worked to the greatest advantage

* Zinc: the specimens sent are very small, and apparently contain very little metal.—EDS.

are undoubtedly those of Jáwar. They are incidentally mentioned by Captain Tod in his *Rajasthan*, and are stated to have yielded a net revenue of Rs. 220,000 a year. They became closed during the great famine, which devastated western India in A. D. 1812-13, during which the miners, dependant on the surrounding country for food, were obliged to leave a locality situated in the heart of the Bheel country, whose starving population seized all the grain intended for the city of Jáwar. The government of Udyapura, too weak to defend itself, and at the time oppressed by the Mahrattas and other freebooters, failed to forward the requisite assistance, and the town suffered the same fate as that of many other places.

3rd. Jáwar lies half way between Kherwára and Udyapura, or some 25 miles due south of the latter place. It is situated in an irregular valley surrounded by hills rising to a height of 1000 to 1500 feet, clothed with rich verdure to their summits, and overlooking an irregular-shaped plain covered over for a space of 5 or 6 square miles, with the monuments of former wealth and importance. Many of these ruins consist of ancient buildings and temples on hills rising in several instances to the height of upwards of a hundred feet, and composed entirely of ashes, which alone fully attest the distant period from which the mines must have been worked. The small river Thirí flows through the plain. It has been in one place bunded up with a masonry bund now in ruins, the excellence of which is attested by the age of the temples built hundreds of years ago on the alluvium of the lake that must have formerly formed an extensive and lovely sheet of water. The chief hill which was used for mining has been worked into a mass of excavations, from which myriads of bats and a stray bear now and then serve to startle the incautious intruders.

4th. It is some 6 years since I first visited Jáwar, and it then occurred to me to induce work-people to re-open the mines, but I was unable to procure specimens of the ores from the jealousy of the then Minister of Udyapura, as to my intentions in bringing these hidden treasures to light. On a subsequent occasion about 2 years ago, I proposed to the present Máhá Ráná of Udyapura, the expediency of opening the mines; he appeared very anxious to do so, and authorized me to obtain miners from Ajmere. Having addressed Lieut.-Col. Dixon on the subject, that officer with great kindness entered fully into my

views and pointed out to me the little use of commencing mining operations at all, unless perfectly sure of the value and richness of the ores to be worked. He mentioned the various descriptions of ore which were most likely to be found, and gave me several useful hints on the subject.

5th. Seeing it was waste of time to do any thing before having procured specimens of the ore, I allowed the matter to rest, till on a recent visit to Udypura, I again mentioned my wish to His Highness the Máhá Ráná, who ordered me to be supplied with whatever was needed, and issued the like orders to an old man, the only remaining inhabitant of old Jáwar, during the time of its prosperity. The Ráná gave me to understand, that the previous year he had directed the old man to smelt a little of the ore which he had done, and brought to Udypura, but afraid of losing his influence, should he divulge the secret of preparing the ore for the furnace, he had refused to give information as to the manner of working it,—the Ráná thereon tried to burn a little himself, but all his crucibles broke.

6th. A few days afterwards on my visiting Jáwar, the old man came and at my request brought a basket of the ore in its rough state. He described it as being found in veins 3 or 4 inches thick and sometimes in buuches, in quartz rock and mixed with other stone. He broke some pieces with a hammer, showing me the good ore and the simple way it was freed from the quartz rock, with which it was mixed (specimens of good ore, inferior ore, and ore mixed with quartz, are sent). The pure ore being very friable is then pounded and freed from quartz and placed in crucibles some 8 or 9 inches high and 3 inches diameter; with necks 6 inches long and half an inch in diameter. The mouth being fastened up, the crucibles are inverted and placed in rows on a charcoal furnace when the ore is fused in about 3 or 4 hours. If pieces of the quartz are allowed to remain with the ore, the crucibles of course break, and hence, the old man informed me, the Ráná's failure. From each crucible the quantity of metal collected does not vary much, a specimen of that extracted for the Ráná from one crucible is sent, as are also remains of ancient crucibles found among the ruins.

7th. I could not discover whether any flux was used in the smelting, or whether the crucibles are entirely or only partially filled previous to the operation.

8th. The above is the description of the process given by the old man. I have only to add, that not pretending to be a geologist, I will not hamper with crude suppositions the opinions of those to whom the Society may make over the specimens for analysis. I am fully satisfied with having brought the mines to light, and I have only to request that, as I see no daily paper, you would oblige me by favouring me with a copy of whatever information may be elicited on the subject of the metal or the ore. It is very probable that with the immense import of all kinds of metals from England, the working of these ancient mines may not now be profitable, still the subject is itself interesting, as bringing to notice another part of India in which mineral riches abound.

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*Description of a new species of Mole (Talpa leucura, Blyth).*

By ED. BLYTH, Esq.

The species of restricted *Talpa* that have hitherto been described amount to four only in number, that I am aware of; viz. *T. europæa*, L., of Europe generally,—*T. cæca*, Savi, of Italy and Greece,—*T. moogura*, Temminck, of Japan,—and *T. microura*, Hodgson, of Nepal, Sikim, Butan, and the mountains of Asám: but the Society's Museum has long possessed specimens of another from Cherra Punji, (N. of Sylhet), which I have recognised as distinct for some years, but now only proceed to describe.

In its external characters, the Cherra Punji Mole differs little from *T. microura*, except that the tail is considerably more developed, though much less so than in *T. europæa*; and the latter is clad and tufted with white hairs, whence I propose for the species the name of *T. leucura*. This animal, also, would seem hardly to attain the size of *T. microura*. An adult female in spirit measures  $4\frac{1}{4}$  inch. long, with tail  $\frac{3}{8}$  inch additional: the latter is of a club shape, much constricted for the basal half, as represented in one of the accompanying drawings. The general colour of the fur, too, is less fulvescent than is usual with *T. microura*. In both of these Asiatic species, as in *T. cæca*, there is no perforation of the integument over the eye, as in *T. europæa*; the skin being there merely attenuated and imperfectly transparent.

But the characteristic distinction of *T. leucura* consists in having only two small præmolars in the upper jaw anterior to the great last præmolar (*carnassiez*, or 'scissor-tooth'); both *T. europæa* and *T. microura* having three,—these being comparatively larger and less separated in the latter, and the *carnassiez* is also much larger in *T. microura* than in *T. europæa*. The posterior spur of the canine (? or *pseudo-canine*\*) is remarkably developed in *T. leucura*, in place of the absent small præmolar. In the dentition of the lower jaw, there are also characteristic differences distinguishing these three species. In the Moles, as in most other *Insectivora*, and also in the *Lemuridæ* (the very peculiar genus *Cheiomys*, which has rodential tusks, excepted), the lower canine is minute and takes the form of an incisor, for which it has been very commonly mistaken ;† and the first præmolar is developed to assume the form of a canine, but locks *posteriorly* to the upper canine (or *pseudo-canine*, and like it has a double fang). There is no instance of a genuine lower canine locking behind the upper one, unless the gnawing tusks of the *Rodentia* and of the Lemuridous *Cheiomys* be regarded as the homologues of canines, which seems to be indicated more by the co-presence of undoubted upper incisors in the *Leporidæ*, than the reverse is by the difficulty of always tracing the origin of upper rodential tusks through the intermaxillaries to the true maxillary bones in the rodents generally. But to return to *Talpa leucura*: following the minute lower canine and the canine-like first lower præmolar of this species, there are two small præmolars anterior to the *carnassiez* or last of the series, and the first of these is conspicuously much smaller than the second ; in *T. microura* the two are of equal or nearly equal size, and occupy more space longitudinally ; while in *T. europæa* these and the *carnassiez* successively enlarge in a regular gradation, the latter being proportionally smaller

\* In all the *Insectivora*, Cuv., which apparently possess upper canines, these teeth have rather the structure of *modified false molars*, and, I believe, have always double fangs, as exemplified by *Talpa*, *Centetes*, and *Gymnura*. I figure the upper *pseudo-canine* of *Talpa europæa* extracted from its socket, by way of illustration.

† No placental mammal has more than three pairs of true incisors, or than three pairs of true molars (distinguished by their not being preceded by deciduary teeth in the young animal, as is the case with all other teeth). Although certain instances occur, as especially in the hoofed ruminants, where the lower canine is hardly (if at all) to be distinguished from the incisors, yet this fourth supposed pair of incisors never co-exists with an undoubted canine (vide the Camels, Horses, Tapirs, &c.), that is among the *placental* mammalia, inasmuch as they are the veritable homologues of those teeth.

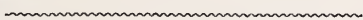




than in the two Indian species. Both scissor-teeth are indeed most developed in *T. microura*, and the teeth generally are more robust.

The specimens of *T. microura* from Asám, like those of Nepal, have generally a very minute tail, which can at least be distinctly enough felt under the fur; but those from the vicinity of Darjiling have no external trace of tail, whether sent as skins or in spirit. I have found, however, no perceptible difference in the skulls and dentition, nor in any other character whatever, that should warrant us in considering the tail-less Darjiling Moles as a distinct species, separable from *T. microura*. The Society's museum contains *T. leucura* stuffed and in spirit, and the skull of the specimen preserved in spirit has been extracted and cleaned; while the dentition of the stuffed specimen is exposed, and is quite similar to that of the other here described. It is not improbable that *T. leucura* may extend its range eastward into China; and in that direction we may look for additional species of *Talpa*, if not also in western Asia. In Africa the genus is unknown, but is represented in the south by *Chrysochlore*; in N. America by *Scalops* and *Condylura*; while in S. America the *Insectivora*, Cuv., do not occur, their functions being performed by numerous diminutive species of *Didelphys*, as also may be said in Australia by the *Perameles* tribe; and it is far from unlikely that Australia may yet be found to produce a fossorial marsupial form, resembling the Moles as other *Marsupialia* present an analogical but superficial likeness to certain other *Insectivora*.

*Explanation of plate.* Skulls of the genus *Talpa*, magnified to twice the natural size.—1, *T. leucura*—2, *T. microura*.—3, *T. europæa*.—1, *a.* Tail of *T. leucura*, nat. size.—3, *a.* Upper pseudo-canine of *T. europæa*, magnified.



*Note on the Formations and Lead Mines of Kohel et Teráféh, Eastern desert of Egypt, by HEKEKYAN BEY. Communicated by Captain T. J. NEWBOLD, F. R. S., Foreign Member of the Philomathique and Geological Societies of France.*

NOTE.—The old Lead Mines of *Kohel* lie near the Red Sea, a day's journey N. by E. from *Gebel Zubára*, in about Lat. 24° 40'. Not far distant are the Lead Mines of *Gebel Rassás*, (*lit.* mountain of lead.)

The use of lead was known at an early epoch in the history of Metallurgy. Mention of it is made by Moses in his song of triumph



and thanksgiving, after the passage of the Red Sea and the overthrow of Pharaoh and the Egyptian host in its waters. ["Thou didst blow with thy wind, the sea covered them : they sank as lead in the mighty waters." Ex. xv. 10.] Again in Numbers xxxi. 22,—where it is mentioned with the other five metals most in use at this early period : ("only the gold, and the silver, the brass, the iron, the tin, and the lead.") Job thus alludes to the use of lead for the permanent record of remarkable transactions, (xix. 23, 24.) "Oh, that my words were now written ! Oh, that they were printed (written ?) in a book ! that they were graven with an iron pen and lead in the rock for ever !" Again in Jeremiah vi. 29. "The bellows are burned, the lead is consumed of the fire, the founder melteth in vain." According to the following passage in Ezekiel, by whom this metal is mentioned more than once, it would seem to have been imported into Palestine by merchants from Tarshish (xxvii. 12.) "Tarshish was thy merchant by reason of the multitude of all kind of riches ; with silver, iron, tin, and lead, they traded in thy fairs." In the time of Zechariah lead appears to have been used for the sealing up and covering of vessels. (v. 8.) "And he cast it into the midst of the ephah ; and he cast the weight of lead upon the mouth thereof."

Pausanias speaks of certain books of Hesiod, written upon sheets of lead, and Pliny states, that public acts were registered on leaves of the same metal. A great number of leaden coins, most of them Greek or Roman, but some representing Egyptian divinities, have been figured by Ficorini in his *Piombi Antichi* ; and frequent allusion is made to leaden coins by the poets.

The ancient Egyptians made use of lead chiefly in their alloys, and for solder.

An ancient *Sistrum* found by Mr. Burton at Thebes is soldered with lead : and I have seen portions of this metal still adhering to cavities in hewn stones in some of the temple walls at Thebes.

The lead appeared to have been used for fastening bars of bronze or iron into the blocks. The bars have disappeared, but have left their traces in a few places, in stains of rust or verdigris. According to Diodorus lead was employed by the Egyptians in purifying the gold dust, found on the confines of Egypt, which he tells us (iii. 11.) was placed with a fixed proportion of lead, salt, a little tin, and barley bran into earthen crucibles closed with clay, and exposed to heat in a fur-

nace, for five successive days and nights. Lead (galena) is not only found at the old excavations of *Kohel et Teráfèh*, but in several other places in the eastern desert of Egypt, generally in short veins and nests, in the limestone, as at Wadi Araba, and the Mokattern. Old lead mines are said to exist at *Gebel Rassás*, as before observed.

T. J. N.

*Formation around Kohel et Teráfèh.*

NOTE.—The beds in this section are taken in the ascending order commencing with the lowest.

T. J. N.

The formation in the plain (*fersh*) towards the N. W. of the *Kohel* is composed of parallel layers of coarse, yellow, compact psammite, a foot in thickness—succeeded by a layer, 4 or 5 inches thick, containing rolled pebbles of quartz, porphyry, granite, gneiss, &c. Seams of crystallised sulphate of lime intercalate these layers; and thin laminæ of the same matter branch through them vertically. Over them we have several beds of yellow psammite tinged with red, and containing nodules of oxidised iron; each bed averaging from  $1\frac{1}{2}$  feet to 2 feet, in thickness. Several thin layers of gypsum, with intervening clays and ferruginous psammites—about four inches thick in the aggregate, and a layer, about eight inches thick, of calcareous sandstone—very compact and hard—containing silicified bivalves in good preservation, succeed.

Overlying them is a series of light green and streaked psammites of a less compact structure than the inferior beds—each layer is separated from the other by an intervening seam of gypsum—about one, or one and a half inch thick.

Over these chloritic psammites we have a close arrangement of parallel bands of gypsum, with intervening layers of disintegrated clay (?) about twelve inches thick. Above them lies stratified sulphate of lime of a compact nature from twenty to twenty-five feet thick, with about seven or eight feet of a less compact sulphate of lime overlying it. Above the sulphates of lime we have a layer of corals: and over the corals a diluvium composed of a dark yellowish marl; on which reposes a gravel of sharp angular fragments of granitic and felspathic formations; some of the fragments are a cubic foot in size;

and a few of the larger blocks are slightly rounded. This diluvium covers the surface of this part of the *Kohel*.\*

The strata of the *Kohel* hill here have a very slight easterly dip. The surface of the ravines passing through it, are inclined in a similar direction, but at a greater angle.

*Lead Mines of Kohel et Teráfah.*

The mines are situated about  $1\frac{1}{2}$  mile from the W. shore of the Red Sea, as before observed. The ore, galena and carbonate of lead, occurs in an argillo-siliceous schist, associated with small quantities of sulphur and iron—a poor carbonate. The Bey visited seven excavations, which are mostly from three to four feet broad, about five feet high, and run down in inclined planes cut in steps. Galena was found in the shaft worked by Brochi; but the indications discovered are not considered favourable. Besides other minerals, titanated iron, mangaese, zinc and fire-clay have been discovered here. The surface of the rock between the mines and the shore is coral limestone, covered with a gravel of granitic, gneiss, porphyry pebbles.

The mines were worked by the ancients: and the ruins of an old, but not extensive station still exist, in detached buildings of loose stones and foundations—some round,—others square. Water is brought from *Gebel Egleh*, or *Edjleh*—four or five hours' distance, but is bad, brackish, and causes vomiting.

The *fersh* of the *Kohel* produces a good deal of *Siyál wood*, (*Acacia Siyáleh*.)

From the mines the Bey took a S. W. direction by *Wádis Egli* and *Sakkari Siyáleh*, and after a day's march arrived at *Wádis Allem* and *Zubára*. In *Wádi Túmtúbah* are Hieroglyphs and a Zodiac, sculptured on some porphyro-felspathic rocks associated with gneiss, schists, and quartz, containing much argillaceous matter. At *Zubára* the principal rock is a ferruginous mica schist with quartz veins, containing bits of emerald. Grey granite, with silvery mica, micaceous amphibole, black steatite, and nodules of iron, occurs, also gneiss.

\* The site of the granites, porphyries and felspars composing the "diluvium," is not far off, as the Bey has a note of having passed some felspathic and granite hills with quartz, invaded by porphyry and serpentine, the day before he reached the *Kohel*. These plutonic rocks lie westerly from the *Kohel*, and continue two days' journey in a N. W. direction, forming the *Kabarais* hills. The *Tella-t-el Kabarais* has a reservoir containing twelve months water. At *Wádi el Assel*, N. E. from *Kosseir*, and *Wádi Hinduseh*, they become intermingled with the sedimentary rocks, limestone and sandstone. At *Wádi Zúg el Bahar* two chains of marly limestone, chalk and psammites occur, overtopped by higher, and isolated clusters of felspathic rocks.

*Remarks on the modes of variation of nearly affined species or races of Birds, chiefly inhabitants of India.*—By E. BLYTH.

The drawing up of a catalogue of species of any class of animals involves a series of decisions as to what are to be considered species or merely varieties of the same species, in all of which decisions no two zoologists will be found to agree, inasmuch as in numerous cases of difficulty such decisions become quite arbitrary. The fact is, we find every variety of gradation from a similitude which does not permit of a distinction being made, to an amount of discrepancy which all would agree in regarding as of specific import. As species are often represented (I do not use this word in reference to a *system* of representation, in which I do not believe,) in distant countries by others bearing a greater or less resemblance to them, in some cases so close as scarcely to permit of discrimination, so there may be others having equal claim to be regarded as of distinct origin, even though utterly undistinguishable apart. Or a particular age or sex only may present some marked diversity, as instanced by the caterpillars of certain lepidopterous insects which are hardly, if at all, to be separately recognised in the *imago* phase of their existence. Mr. Swainson collected in Brazil specimens of a butterfly, *Papilio (Podalirius) nomius*, figured in his 'Zoological Illustrations,' which would hardly be supposed to inhabit likewise Lower Bengal; yet a species which, so far as can be judged from his very careful representation, is absolutely similar, abounds in the vicinity of Calcutta and other parts of Bengal during the dry hot season. It is true that we also get here the *Cynthia cardui*, which is a butterfly of almost universal distribution, alike in the British islands, America, and Australia:\* but it does not appear that *Papilio nomius* has been observed elsewhere than in India and Brazil, and we can hardly suppose its race to have been conveyed from one of these countries to the other, or to have reached them both from a common point of divergence.

\* We have compared specimens from Calcutta, Central India, the E. and W. Himalaya, and Afghanistan, with others from Europe and W. Australia, and could detect no distinctive character whatever.

Races deviate from the similarity which obtains among different individuals of the same race, in every way in which a difference could well be exhibited. Thus some differ only in size, as the greater and less European Bullfinches (of which the former is, we believe, the true *Loxia pyrrhula*, L.,)—the *Turtur orientalis* and *T. auritus*,—the *Charadrius pluvialis* and *Ch. virginicus*,—the *Larus glaucus* and *L. islandicus*,—the Asiatic *Nettapus coromandelianus* and the Australian *N. bicolor*, Lesson,—*Buceros affinis* of the Deyra Doon and *B. albirostris*,—*Alcedo isipida* and *A. bengalensis*,—*Caprimulgus ruficollis* and *C. asiaticus*,—*C. monticolus* and *C. affinis*,—*Enicurus frontalis*, nobis, of the Malayan Peninsula and *E. speciosus* (Horsfield), of Java,—*Sylvia Jerdoni*, nobis, and *S. curruca*, (Gm.) both Indian birds,—*Cuculus canorus*, *C. himalayanus*, and *C. poliocephalus*, which are alike inhabitants of the Himalaya, &c. &c.

Or, with exact similarity of size and proportions, they may differ more or less in colour,—as the different species of Asiatic *Treron* with yellow feet, *e. g.* *Tr. phænicoptera* of Bengal and Upper India, *Tr. chlorigaster* of S. India and Ceylon, and *Tr. viridifrons* of Burma; or the long-tailed *Tr. apicauda* of the S. E. Himalaya and *Tr. oxyura* of the Malay countries :—also the species or races of black-headed *Munia*, as *M. sinensis* of the Malayan peninsula, *M. rubroniger* of Bengal, Nepal, Asám, Arakan, and Tenasserim, and *M. malacca* of S. India and Ceylon. Such differences may be very slight indeed and yet constant, as in the foregoing instances and many more :—such as *Carpophaga ænea* of the Nicobar Islands as compared with specimens from the neighbouring countries,—*Palumbus Elphinstonei* of the Nilgiris and of Ceylon—*Oriolus melanocephalus* of Malabar and Ceylon and that of Bengal, Nepal, and the countries eastward,—*Pomatorhinus erythrogenys* of the N. W. and of the S. E. Himalaya,—*Caccabis chukar* and *C. græca*, auctorum,—the *Cyaneculæ*, the *Geocichlæ*, &c.; among which may be further enumerated the common Sparrows of India and of Europe, and the *Accentor alpinus* of the mountains of Europe and *A. nipalensis* of the Himalaya. The *Garrulus glandarius*, *G. melanocephalus*, and the Japanese Jay,—the *Sitta europæa*, *S. cæsia*, and *S. himalayensis*,—and the bare-necked white Ibises (*Threskiornis*) of India, Africa, and Australia, afford other characteristic examples.



In several such cases where the sexes differ, the adult males only of two or more races can be distinguished, as exemplified by *Thamnobia cambaiensis* of N. and Middle India and *Th. fulicata* of S. India and Ceylon,—also by some of the Indian long-tailed *Nectariniæ*,—by *Tephrodornis pelvica* and *T. sylvicola*,—by certain of the *Kallij* Pheasants (*Gallophasis*), and of the Tree Partridges (*Arboricola*). Or only the older males may assume a distinguishing mark, as in *Lanius superciliosus* of the Malay countries as compared with its representative in India. Or perhaps the old of both sexes may alone be distinguishable, as instanced by the amethystine *Chrysococcyx xanthorhynchos* of the Malay countries and its emerald-green Indian representative. Lastly, the nuptial plumage may alone present a constant diversity, which is very great in *Motacilla alboides* and *M. dukhunensis*; and we should infer that *Hydrochelidon leucopareia* so common in India, and *H. fluviatilis*, Gould, of Australia, were not to be known apart in their non-breeding livery.

That we should not be too hasty in setting down these slight and apparently trivial differences as denoting varieties only of the same particular species, is indicated by the fact that with a constant variation of colour, however seemingly unimportant, is sometimes, if not commonly, associated a marked difference in the voice. This is very decided in the case of *Pratincola indica*, nobis, as compared with that of the European *Pr. rubicola*; the wild *Turtur risorius*, (L.) of India has also a very different voice (or *coo*) from the domesticated Dove so common in cages and called by the same name: and we should expect that the three Cuckoos before referred to will prove to differ remarkably in voice; while (so far as we can learn) the *Dendronanthus agilis* of India never emits the fine musical notes of the very closely affined *D. trivialis*. How excellent a criterion is furnished, in some cases at least, by the voice is illustrated by the multifarious breeds of the common domestic fowl, all of which speak the same language, which is a very different one, in every note uttered, from that either of the wild *Gallus Sonneratii* of S. India, or *G. Stanleyi* of Ceylon. But a more conclusive proof, that exceedingly close external resemblance may subsist when the species are unquestionably diverse, is deduceable from the fact of the very extraordinary conformation of

the trachea in the female alone of *Rhynchea australis*, which peculiarity does not occur in either sex of *Rh. bengalensis*.

Following up this enumeration of the variety of modes of differing among closely affined races of birds, it may next be remarked that a great difference of voice and of habits may be only indicated in the structure by minute variations in the form of particular feathers; *e. g.* *Corvus corone* and *C. americanus*:—*Pernis cristata* is only distinguished from *P. apivora* by an occipital tuft of lengthened feathers more or less developed, in addition to its different habitat; and in *Spizaetus limnaetus* and *Sp. cristatellus*, the last named has a similar occipital crest generally much more developed, this being again the chief distinction besides that of geographical distribution, and that the former race assumes an ultimate phase of plumage which is never (so far as we can learn) seen in the other. The very different form of the crest and adjacent plumage is again the only distinction we are acquainted with between the larger Indian Pelican (*Pelicanus javanicus*) and the closely affined African species (*P. onocrotalus*). In many other instances the distinction is best shewn in the varying relative proportions of the wing-primaries, or even in that of a single primary, as exemplified by *Acrocephalus arundinaceus*, (L., vel *Sylvia turdoides*, Tem.), of Europe, and *Acr. brunnescens*, (Jerdon,) of India.\* *Pycnonotus jocosus* of Burma and Penang has always a shorter and more intensely crimson ear-tuft than *P. jocosus* of India, and we have been assured that the voices also differ. The *Irena puella* of India, and also of Arakan and the Tenasserim provinces, differs constantly from that of the Malay countries by having shorter tail-coverts.

Then we have cases in which sundry of the foregoing differences are variously combined. In *Loxia himalayensis*, *L. curvirostra*, and *L. pytiopsittacus*, the size is successively larger, with a successively more robust conformation. So likewise in *Gracula javanensis* and *Gr. intermedia*. The restricted *Edoliæ* differ slightly in size only, except that the larger have successively the frontal crest proportionally more developed. In *Cannabis linaria* (*Fringilla linaria*, L., v. *Linaria canescens*, Gould), as compared with *C. minor*, a difference of size is combined with a very slight one of plumage, and the song-notes are here again distinguishable. In *Pratincola atrata*, nobis, of the high-

\* Vide *J. A. S.* XV., 288.

lands of Ceylon, as compared with *Pr. caprata*, a larger size is combined with a proportionally larger bill. The same is more strongly shewn in *Garrulax pectoralis* as compared with *G. moniliger*, and in *Hiaticula Geoffroyi* as compared with *H. Leschenaultii*; the plumage, and the seasonal changes of plumage of the two last named species, being absolutely alike. *Emberiza palustris* would resemble *Emb. schanicolus*, only that the beak is altogether of a different shape. So with *Montifringilla nivalis* and *Plectrophanes nivalis*, all the difference is in the bill (so far as we can remember). *Treron curvirostris* and *Tr. malabaricus* are alike in size and plumage, but their bills are of a very different form, and there is a bare space surrounding the eye of the one and not of the other. *Pomatorhinus schisticeps* resembles in plumage *P. leucogaster*, but has a larger bill and much more developed and straighter claws. *Calornis affinis*, nobis (*Turdus columbinus*? Gmelin), has merely a larger size and generally duller plumage than *C. cantor*. It is easy to multiply examples, grading from absolute similarity to the exhibition of every amount and variety of dissemblance.

In some instances where slight differences of colour only, especially of shade of hue, constitute the sole diversity, we have the presumptive evidence afforded by a series of many analogous cases, subject to the same conditions of climate, &c., manifesting the same phænomenon, which is therefore to be ascribed with the greater probability to the operation of a cause inducing the particular variation. Thus several Indian birds are much darker and more intensely coloured in Ceylon; —e. g. *Corvus splendens*, *Acridotheres tristis*, and the female of *Copsychus saularis*: *Dicrurus leucopygialis* of Ceylon thus differs from *D. cærulescens* of India in having only the vent and lower tail-coverts white.\* *Pomatorhinus melanurus* of Ceylon has the colours more fully brought out, as compared with *P. Horsfieldi* of peninsular India. *Palumbus Elphinstonei* of Ceylon wants the ruddy margins of the dorsal feathers seen in the corresponding race of the Nilgiris. *Lori-*

\* *Dicrurus longicaudatus* of Ceylon quite resembles that of India; whereas *D. macrocercus* of that island is constantly smaller. On the other hand, *D. macrocercus* is undistinguishable in India, Burma, and Java, while in Burma *D. longicaudatus* is replaced by the smaller but otherwise similar *D. intermedius*, nobis. The small Ceylon race of *D. macrocercus* I have elsewhere termed *D. minor*.

*culus asiaticus*, (Lath., v. *indicus*, Gmelin,) differs only from *L. vernalis* of India, Burma, and Java, in having the crown deep red, with an inclination to greater variation of hue on other parts. *Hirundo hyperythra* of Ceylon, as compared with *H. daurica*, (like *H. cahirica* as compared with *H. rustica*,) differs only in having the entire underparts very deep ferruginous. *Megalaima zeylonica* of Ceylon is merely smaller than *M. caniceps* of India, with the lower parts decidedly darker; and the Cinghalese representative of the rufous or bay Woodpeckers (*Micropternus*) is much deeper-coloured than those respectively of S. India, Bengal, and the Malay countries. On the other hand, *Halcyon gural* of Ceylon perfectly resembles that of India generally and of Burma, whereas the Malayan race (*H. leucocephalus*,) is smaller and of deeper hue with a coloured shine on the crown. So, also, *Orthotomus longicauda* is deeper-coloured in the Malayan peninsula than in India, but not so in Ceylon. In general, the Malayau species, unless obviously distinct, present no difference of shade from those of India and other countries to the northward; and the only additional instances we can call to mind of their being thus distinguished are those of *Trichastoma olivaceum* of the Malayan peninsula as compared with *Tr. Abbotti* of Arakan,—*Megalaima trimaculata* and *M. cyanotis* of the same countries respectively,—and *Picus moluccensis* and *P. canicapillus*, ditto:\* the Tenasserim Hoopoe is very deep-coloured in comparison with that of Arakan, Bengal, and Europe, and seen sometimes in the Nilgiris; but the ordinary Hoopoe of S. India and Ceylon is smaller with the exception of its beak, and likewise rather deep-coloured.† The common Jungle-cock (*Gallus ferrugineus*) is again deeper-coloured in the Malayan peninsula and archipelago, besides being coarser in the leg, and wanting the conspicuous pure white cheek-lappet which so ornaments the Bengal Jungle-fowl. Also (so far as I have seen), the Malayan *Paromuticus* is far more vividly coloured than that of Arakan; the latter being comparatively much darker. But we can neither generalize upon these facts, so as to predicate the like in other instances, inasmuch as the majority of species common to India and Ceylon or to India and the Malay countries do not appear to vary in the least degree, nor can we draw the dividing line as to what can be satisfactorily considered

\* *Megalaima cyanotis* and *Picus canicapillus* inhabit also the Tenasserim provinces.

† I have never seen a Hoopoe from the Malayan peninsula.



*species*, as the gradations continue unbroken to the most marked specific types, and which still may hold a parallel in the respective regions, as the peculiar Jungle-fowl and Spur-fowl (*Galloperdix*) of Ceylon, as compared with their Indian congeners, may suffice to testify.

In poleward or very elevated regions we remark the contrary tendency of animals, to become paler in colour, whether particular species or evident varieties of those which inhabit elsewhere. For example, the Tibetan fauna generally would seem to exemplify this law; and several of the birds of Scandinavia as compared with those of Britain are deficient in colour, greys passing into white, and fulvous into white or grey. The only difference between *Sitta europæa*, L. (vel *S. asiatica* and *sericea*, Temminck, and *S. uralensis*, Lichtenstein,) of Scandinavia and the northernmost parts of Europe generally, from *S. cæsia* of the rest of Europe, consists in the lower parts of the former being pure white where those of the latter are pale fulvous; and in *S. cinnamomventris* of the Himalaya, again, the only difference consists in the same parts being altogether of the deep and dark ferruginous which is confined to the flanks and lower tail-coverts only of the two preceding races. *Picus minor* and *Parus ater* and *P. palustris* of Scandinavia are thus readily distinguished from the corresponding races of Britain: and it is curious that *Orites caudatus* of the N. of Europe would appear to have invariably a pure white head, devoid of the dark sincipital bands which occur constantly upon this species in Britain.

There is yet another phænomenon which adds to the difficulty of discriminating species in some, though not many, instances; and this is the production of hybrid races and individuals of mixed origin of every grade of intermediateness. In some cases the hybrids are not known to reproduce, and so to form a race, as instanced by the mule grouse of Northern Europe (the cross between the Capercailzie and the Black Grouse), together with other hybrids produced by sundry wild *Gallinacæ* and *Anatidæ*: but there are some hybrids which are quite as prolific as their parents, as among mammalia those raised between the humped and humpless domestic cattle, and among domestic birds the mixed progeny of *Anser cinereus* and *A. cygnoides*.\* So in the

\* All the domestic Geese of India (so far as I have seen) are of this mixed species, and in no animals can specifical characters be more strongly marked than in the parent races, extending to the voice and habits. So with the cattle,—the



Himalaya and elsewhere the different races or species of *Kallij* Pheasants inter-breed, and the hybrids so produced again both *inter se* and with the pure parent races, whence every gradation from one to another may be traced in a series of specimens.\* And the same is shewn with *Coracias indica* of India generally and *C. affinis* of the countries eastward, to the extent that in some districts it is difficult to procure either with quite the typical colouring; but we are not aware that the same happens in Sindh and its vicinity, with regard to *C. indica* and the equally affined *C. garrula*, which latter European species is there not uncommon. I know of no other decided intermixture of wild races of birds in India, though I have seen some reason to suspect it in the instance of *Treron phænicoptera* and *Tr. chlorigaster*; and perhaps also *Iora typhia* and *I. zeylanica*: as regards the latter at least, we occasionally obtain specimens in Bengal that had imperfectly assumed the black cap and dorsal plumage so constant in the old males of S. India and Ceylon, but I never saw this dress approaching to perfection in a Bengal specimen, and it may be an instance of climatal variation which gradually attains its ultimatum as we proceed southward in the Indian peninsula and Ceylon, though not in the corresponding and lower latitudes of the Malayan peninsula. There we have a remarkably different colouring in the male *I. scapularis*, Horsfield, which again is however a darkening of hue, though quite in a different way; and it remains to observe whether a gradation exists in the latter instance as in the former. The three exactly accord in size and structure, as in so many corresponding instances; but another and much larger *Iora* inhabits the whole eastern side of the Bay of Bengal, the male of which is *I. Lafresnayei*, Hartlaub, and the female was subsequently named by me *I. innotata*.

These remarks have been thrown together preparatory to the draw-

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hump is only one distinction out of very many, but is nevertheless so characteristic of the animal as to be well exhibited at an early period of fœtal life; and the voice is again very different, and the habits in various particulars, especially in the fact of the European cattle seeking shade and water in hot weather, whereas the humped cattle seem indifferent to the hottest Indian sun, and never seek water to stand knee and belly deep for hours, as so beautifully pictured of the humpless race by the author of the 'Seasons.'

\* This is well shewn in the Society's Museum. Vide *J. A. S.* XVIII., 817.

ing up of a list of all the birds of India, Burma, and the Malayan peninsula, with those of Sindh, Asám, Ceylon, the Nicobars, &c. (so far as I am able), in which I propose to offer such observations on the affinities of many of the species or races as may enable the student to draw his own conclusions respecting their claims to be regarded as species or as mere varieties. A bare list of names, especially if unaccompanied by synonymes, is oftentimes of little or no utility whatever as a guide, or even worse so often as mistakes in the determination of species occur, or those of the rarest and most casual occurrence are set down without a word of remark together with the commonest and most generally diffused. Where a constant variation, however trivial, obtains, it should be duly noted, and the value that the particular writer attaches to it is of small consequence : and it should likewise be distinguished whether the author writes from his personal knowledge or from the observations of others, if any authority is to attach to his production.

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*Conspectus of the Ornithology of India, Burma, and the Malayan peninsula, inclusive of Sindh, Asám, Ceylon, and the Nicobar islands.**
—By E. BLYTH, Esq.

Order I. SCANSORES.

Fam. PSITTACIDÆ.

Subfam. ARINÆ.†

Genus PALÆORNIS, Vigors.

Totá, Sugá, Hind. : Tiyá, Beng. : Girawa, or Rana Girawa, Cingh. : Kyet-ta-rwe, Arakan.

* The Andamans, with the Maldives and Laccadives, would also have been added, had more information been available respecting this branch of their fauna.

† The PARROT family divides naturally into five sub-families, of which the second and last are the most strongly characterized by peculiarities of structure.

1. CACATUINÆ (or Cockatoo group). Comprising the genera *Dasyptilus* (?), *Microglossum*, *Calyptorhynchus*, *Cacatua*, *Nestor*, and *Strigops* (with sub-divisions of the third and fourth). The first and second of these are peculiar to the Papuan islands. The third also occurs in N. Guinea, but is chiefly developed in Australia with Tasmania. The fourth inhabits (in different species) Australia, Papua, the Philip-

1. P. ALEXANDRI (Edwards, pl. 292).

SYN. *Psittacus Alexandri*, L.*Ps. eupatria*, L.*Psittaca ginginiana*, Brisson. } the female.*Psittacus guineensis*, Scopoli (nec *guineensis*, Gmelin).*Ps. Sonneratii*, Gmelin.*Palæornis nipalensis*, Hodgson, *As. Res.* XIX. 177.

pines, Moluccas, and Borneo. The fifth very recently comprised two species, one in N. Zealand, the other—already extinct—in the islet called Philip island near Norfolk island (the fauna and flora of which islands ally them chiefly with N. Zealand). The sixth, consisting of but one known species rapidly verging upon extinction (the crepuscular and Owl-like *Strigops habroptilus*, G. R. Gray), is also a N. Zealander.

2. PLATYCERCINÆ (or ground Parrakeets). Inhabiting N. Holland, with a few outlying species of *Platycercus* only in N. Zealand and Polynesia proper, and one *Aprosmictus* extending its range to N. Guinea. This group is nearly affined to the preceding one, but has a remarkable structural distinction from all other birds in the absence of bony clavicles, which in the rest of the *Psittacidæ* (as in almost throughout the class) are united to form the *furcula* or “merry-thought” bone. The members of both of these sub-families are mainly eaters of grain and other farinaceous seeds, but some of the Cockatoos feed also largely on bulbs, and the *Calyptorhynchi* partly on large insect larvæ.

3. ARINÆ (or Maccaw group). Chiefly S. American, one small species only occurring in the proximate regions of N. America; but with a subordinate division in S. E. Asia and its archipelago, Africa, and Australia, comprising the genera *Palæornis*, *Tanygnathus*, and *Agopornis*, with *Prioniturus* (which would seem to be intermediate to the first and second), in the former regions, and *Polytelis* in the last named. This eastern subgroup is less frugivorous than the western; and all would appear to be birds of vigorous flight, an attribute in which the whole family has been supposed deficient.

4. PSITTACINÆ (or ordinary Parrots). Chiefly S. American, with a few species in Africa and Madagascar, and a particular division comprehending *Eclectus* and *Loriculus* in S. E. Asia and its archipelago. N. B. This and the foregoing group are affined, and the species are, in general, much more frugivorous than the members of the two preceding subfamilies, and the *Psittacinæ* more so than the *Arinæ*; but the great majority feed also on hard grain.

5. LORIINÆ (or Lories). Peculiar to the Austral-asian archipelago, with Papua, Australia, and Polynesia. This subfamily is particularly distinguished by the peculiar structure of the tongue (varying somewhat in different genera), which is adapted for extracting the nectar from flowers; the species also feed upon soft fruits, but never on grain, and the beak is proportionally feeble.

Chandaná ('Sandal-wood coloured,' alluding to the yellowish tinge of the under parts and upper portion of the back), Beng.: *Karan sugá* and *Kararia* of Nepal (Hodgson): *Ráé Totá* ('Royal Parrakeet'), Hind. (Jerdon): *Kyai Phoungka*, Arakan (Phayre).

HAB. Hilly regions of all India proper, from the sub-Himalayas to Ceylon inclusive; Asám; Sylhet; Arakan; Tenasserim provinces.

2. *P. TORQUATUS* (Daubenton's *Pl. Enl.* 551).

SYN. *Psittaca torquata*, Brisson.

Psittacus Alexandri, var. B, Latham.*

Ps. cubicularis, Hasselquist.

Ps. docilis, Vieillot.

Ps. steptophorus, Desmarest.

Var. *Sulphur Parrakeet*, Shaw.

Tiyá (or *Teeyá*, imitative of voice), Hind.: *Tent'hia Suga*, Nepal (Hodgson): *Gallar* of some, H.: *Lybar*, Masuri (Hutton): *Lybar Totá*, S. India (Jerdon): *Kyai-gyot*, Arakan (Phayre).

HAB. Plains of India; Ceylon; Asám; Sylhet; Arakan; Tenasserim provinces; Malayan peninsula (to latitude of Penang): W. Africa (apud Swainson), smaller variety.†

In general, the *Psittacidae* are exclusively vegetable-feeders, as much so as the *Columbidae*: but the *Calyptorhynchi* are described to cut up decaying trees, by means of their extremely powerful beaks, to get at the larvæ in the interior of the wood; and the *Loriine* (at least in confinement) will eat soft maggots. This general diet of the group helps to bear out the analogy which the *Psittacidae* among birds bear to the *Quadrumana* among mammalia (though it is true that many of the *Quadrumana* are, in the wild state, far more omnivorous than is generally supposed). In their whole structure, the *Psittacidae* manifest no particular affinity (that we can discern) for any of the zygodactyle *Insessores*; but they decidedly constitute a very distinct ordinal type, shewing most relations with the diurnal *Raptores*: and regarding them as the most highly organized of birds, we do not hesitate to follow the arrangement of those zoologists who place them at the head of the class, parallel to the Apes and Monkeys among the mammalia.

* Except that there is no patch of crimson on the wing-coverts of *Ps. torquatus*.

† "The Rose-ringed Parrakeet," writes Mr. Swainson, "is one of the few birds of Senegal whose geographic distribution extends from east to west. Of four specimens in very perfect plumage now before us, three are from Western Africa and

Remark. This is the only Indian Parrot (so far as we are aware) that affects the vicinity of human habitations, flocks of them often settling upon buildings, especially if situate in gardens with trees about them, and one or more pairs occasionally breeding in suitable cavities about buildings. It is the only species observed wild in the densely populous neighbourhood of Calcutta, but in jungle districts becomes replaced by No. 4.

3. *P. SCHISTICEPS*, Hodgson, *As. Res.* XIX. 178.

SYN.? *Conurus himalayanus*, Lesson, in Belanger's *Voyage*.

Mádana Sugá, Nepal (Hodgson): *Puhari Tuiya*, Masuri (Hutton): *Gági* of Calcutta bird-dealers.

HAB. Sub-Himalayan region (exclusively).

Remark. The Masuri name of this species (or 'mountain Tuia') well expresses its near affinity for the next. The adult sexes differ in the male having a small maronne spot on the wing, which is wanting or barely indicated in the female, and the black demi-collar is also rather more developed. The young have generally but a trace of the slaty-blue cap, but this is fully developed in some few specimens, though without the black demi-collar which borders this cap in the adult. The beak, which in *P. cyanocephalus* is bright yellow, is in the present species yellow tinged with coral-red, and in adults of all the other species is bright coral-red.

4. *P. CYANOCEPHALUS* (Edwards, pl. 233; Daubenton's *Pl. Enl.*, 264).

SYN. *Psittacus cyanocephalus*, L.

Ps. flavitorquis, Shaw.

Ps. annulatus, Kuhl.

Palæornis flavicollaris, Franklin.

Psittaca bengalensis, Brisson.

} the female.

one from Madras: between the first three of these, there is no difference whatever in size; but that from the East Indies is considerably larger; the length of its wing, in fact, measuring 7 in., while that of the Senegal race is not quite 6 in." *Birds of W. Africa*, II, 175. Of numerous Indian specimens examined, from all the above named localities, we have found the length of the wing to be very regularly $6\frac{1}{2}$ in., rarely $\frac{1}{4}$ in. more or less.

Psittacus erythrocephalus, Gmelin.

Ps. ginginianus, Latham.

Ps. rhodoccephalus, Shaw.

Var. *Ps. narcissus*, Latham (with coloured figure).

Faridi, and *Fariádi* ('plaintive'), Bengal; *Tui Sugá* (the first or specific name imitative of cry), Nepal (Hodgson); *Tuia Totá*, S. India (Jerdon); *Bengali totá*, Panjab; *Kyai-ta-ma*, Arakan (Phayre).

HAB. Upland and jungle regions of all India proper; Ceylon; Asám; Sylhet; Arakan; Tenasserim provinces. *N. B.* It occurs in open jungle, in the Bengal Sundarbans. To the westward, leaving the alluvial soil of the Ganges, it seems entirely to take the place of *P. torquatus* in the Midnapur jungles.

5. *P. MALACCENSIS* (Daubenton's *Pl. Enl.* 887; Levaillant, pl. 72).

SYN. *Psittacus malaccensis*, Gmelin (nec Latham).

Ps. erubescens, Shaw.

Ps. ginginianus, var. C, Latham.

Ps. barbatulatus, Bechstein.

Bayan, Sumatra (Raffles); *Madná Bhola* of the Calcutta dealers.

HAB. Malayan peninsula; Sumatra.

6. *P. ERYTHROGENIS*, Blyth, *J. A. S.* XV, 23, 51, 368.

HAB. This beautiful species is common in the Nicobar Islands, and does not appear to have been hitherto observed elsewhere.

7. *P. CANICEPS*, Blyth, *J. A. S.* XV, 23, 51.

HAB. Nicobar Islands; Malayan peninsula (latitude of Penang).

Remark. Of this fine and strongly marked species, we have seen two specimens only; one with a coral-red beak, procured alive (with its wings and tail much mutilated) from a Nicobarian savage, and which is now in the Society's Museum; the other with a black beak, from Province Wellesley.

8. *P. BARBATUS* (Daubenton's *Pl. Enl.* 517; Swainson's *Zool. Ill.*, 2nd series, pl. 16).

SYN. *Psittacus barbatus*, *Ps. pondicerianus*, and *Ps. borneus*, Gmelin.

Ps. bimaculatus, Sparrman.

Ps. javanicus, Osbeck.

Ps. Osbeckii, Latham.

Ps. mystaceus, Shaw.

Palæornis nigrirostris, Hodgson (the young female).

P. modestus, Fraser (the very young female).

Madná ('charming,' 'pleasing'), the red-billed bird;
Kájlá (as having the black pigment, *Kájal*, applied to the eye-brows; alluding to the black loreal line), the black-billed bird, Hind.; *Imrit Bhila*, Nepal, (Hodgson); *Bettet*, Java, (Horsfield).

HAB. Hilly parts of Bengal, Nepal, Asám, Sylhet, Arakan, Tenasserim, Malayan peninsula (to latitude of Penang), Sumatra, Java, and Borneo.

Remark. We have never seen this bird in Malacca collections, nor does it appear to occur wild in any part of the Indian peninsula or in Ceylon; hence the name *pondicerianus* cannot be adopted. Specimens from Java are perfectly similar to those of India. In a presumed female observed in captivity, the upper mandible changed from black to coral-red when the bird was about 18 months old.

9. *P. COLUMBOIDES*, Vigors (Jerdon's *Ill. Ind. Orn.*, pl. 8).

SYN. *P. melanorhynchos*, Sykes,—the young.

Madan-gowr Totá, H. (Jerdon).

HAB. Nilgiris; Malabar.

10. *P. CALTHRAPÆ*, Layard, Blyth, *J. A. S.* XVIII, 800.

HAB. Mountainous interior of Ceylon.

Remark. In the adult specimen described, *loc. cit.*, the middle tail-feathers had not attained their full length: in three other adults since received, they are full grown but very short, measuring but from $4\frac{1}{2}$ in. to $5\frac{1}{2}$.*

* In this enumeration of the species of *Palæornis*, I have provisionally omitted to include a race (or slight variety of *P. torquatus*?) which inhabits Ceylon, and which I formerly supposed to be *P. bitorquatus*, Kuhl, judging from a female only which I had then reason to believe was procured in the Mauritius. Mr. Layard considers it distinct from the ordinary *P. torquatus* of Ceylon, &c., and has obligingly procured for me a living male not yet received.—Since the foregoing was in type, I have received a further communication from Mr. Layard, in which he mentions having obtained a number of skins. *P. bitorquatus*, a species which is

Genus TANYGNATHUS, Wagler.

11. *T. MALACCENSIS* (Swainson's *Zool. Ill.*, 1st series, pl. 154, the male? or adult of either sex?).

SYN. *Psittacus malaccensis*, Latham (nec Gmelin).

Ps. incertus, Shaw.

Tana, Malacca.

HAB. Malayan peninsula; Sumatra.

Remark. This species is essentially a small *Palæornis* with a short and sub-even tail, and is somewhat allied in its colouring to *P. columboides* and *P. Calthrapæ*, which last (as we have seen) has a shorter tail than the rest of its genus. *T. macrorhynchos*, upon which the present genus was founded, is also closely related to *Palæornis*, but upon a larger scale; and the two bear the same mutual relationship as subsists between *P. Alexandri* and *P. cyanocephalus*. Intermediate, we have *T. sumatranus*, (Raffles), and we believe *Ps. melanopterus*, Gm., and others, with the *Prioniturus setarius*, (Tem.), remarkable for the shape of its tail, which however may still be considered intermediate to those of *Tanygnathus* and *Palæornis*. In *T. sumatranus* (both sexes of which we have possessed together and studied alive), the male has a coral-red bill and the female a white bill; and the same would appear to obtain with *T. malaccensis* (if the difference of plumage in different specimens be characteristic of sex and not merely of age): and in the great *T. macrorhynchos*, the nearly affined but smaller and less powerfully billed *T. sumatranus*, and the small *T. malaccensis*, are alike perceived a peculiar yellow margining of the wing-coverts, which occurs in no species of *Palæornis*. Nearly affined again, we have the minute African and Madagascar species forming the genus *Agapornis*, to which *T. malaccensis* has by some been referred.

It remains to ascertain whether both *T. macrorhynchos* and *T. sumatranus* do not also inhabit the more elevated districts of the interior of the Malayan peninsula. In a collection which Capt. Charleton made at Malacca, there was a fine specimen of the former, but we are not aware that it was obtained wild in that vicinity, and rather doubt that either of these species occurs wild except in Borneo and to the eastward.

very little known, and is said to inhabit the island of Bourbon, is the only other *Palæornis* not included in the above list; the two Australian species being properly separated to form the genus *Polytelis*.

Subfamily. PSITTACINÆ.

Genus. LORICULUS, Blyth.

12. L. GALGULUS (Edwards, pl. 293, f. 2).

SYN. *Psittacus galgulus*, L.*Ps. pumilus*, Scopoli.*Serindak*, *Sindada*, Malacca ; *Serindit*, Sumatra (Raffles).

HAB. Malayan peninsula ; Sumatra.

13. L. VERNALIS (Swainson's *Zool. Ill.*, 2d series, pl. 1).SYN. *Psittacus vernalis*, Sparrman.*Ps. galgulus* apud Horsfield, *Lin. Tr.* XIII, 182.*Latkan* ('pendent'), Hind., Bengal ; *Bhorá* or *Bhoará*, S. India, (Jerdon) ; *Kyai-tha-da*, Arakan (Phayre) ; *Silindit*, and *Silinditum*, Java (Horsfield).

HAB. Hilly parts of India, from the sub-Himalayan region to S. India ; also Asám, Sylhet, Arakan, Tenasserim, and Java.

Remark. We have never seen this species from the Malayan peninsula, nor the preceding one from any country where the present is found ; though both are extremely numerous in their respective habitats. *N. B.* Javanese specimens differ in no respect from Indian, though Dr. Horsfield states that the Javanese bird differs from *Ps. vernalis*—(*Mus. Carls.*) in size, and in the proportions of the wings to the tail." The latter may depend on the *mounting* in museum specimens.

14. L. ASIATICUS (Edwards, pl. 6).

SYN. *Psittacus asiaticus*, Latham.*Ps. indicus*, Gmelin.*Pol-Girawa*, Cingh.

HAB. Ceylon.

Remark. Peculiar as this species (or race) is to Ceylon, the names which have been applied to it are infelicitous. Its distinctive colouring from *L. vernalis* would appear to be constant (vide description in *J. A. S.* XVIII, 801). Nevertheless, it is so very closely affined to the Indian bird that many would prefer to regard it as a permanent local variety of the same species. Its distinctions from the Philippine *L. rubrifrons*, (Vigors), remain to be pointed out : and we have seen drawings of another, similar, but with the entire head as deep red

(from the S. of China?) *N. B.* Neither the *Electi* nor the *Loriculæ* have the tongue filamented as in the *Loriinæ*, with which they have been generally but quite erroneously classed. These two genera form a particular and peculiarly Asiatic division of the *Psittacinæ*, immediately preceding the *Loriinæ*. Such at least is the result of our long continued study of living specimens.

Here it should be remarked that the *Eos ornata* (*Psittacus ornatus*, Gmelin,) is stated by Raffles to inhabit the Malayan peninsula, but doubtless by mistake. With other Lories, &c., it is commonly brought by the Malays from the more eastern islands of the Archipelago, and may be frequently purchased in Calcutta and other ports.

Summary view of the distribution of the PSITTACIDÆ in India and the neighbouring countries. From the foregoing catalogue it follows that only two generic forms of *Psittacidæ* inhabit India, viz. *Palæornis* and *Loriculus*, nor are we aware that another occurs in all continental Asia, with the exception of *Tanygnathus* as exemplified by *T. malaccensis* in the Malayan peninsula, this species being however barely separable from *Palæornis*, and the peninsula itself belonging physically to the region of the archipelago, or *Indonesia*, as this region has been recently designated by Mr. Logan. *Tanygnathus* should accordingly be regarded as strictly an Indonesian form. In the Asiatic countries westward of Sindh, it does not appear that any species of Parrot has been observed,* and we know but little of those of Indo-China eastward of the British possessions on that side of the Bay of Bengal, or those of the southernmost provinces of China. In the great Indonesian or Austral-asian archipelago, the number of genera and of super-generic forms gradually increases to the eastward, where the Lories and species of white Cockatoo, also the two species of *Electus* among the *Psittacinæ*, and the large *Tanygnathi*, are met with in Borneo, Celebes, the Moluccas, and some of them even in the Philippines; forms of black Cockatoo appearing likewise in the Papuan group; while in Australia the *Psittacidæ* attain their maximum of developement as regards the number of genera and of species, though the two generic forms of India and certain others of Indonesia are foreign to the Australian fauna.

* Lieut. Irwin remarks.—“The Parrot and Maina are scarcely natives of Turkestan, or at least of the country beyond the Oxus.” *J. A. S.* VIII., 1007. Surely neither of them is found there at all, *i. e.* any Parrot, *Acridotheres (verus)* or *Gracula*!

Sumatra and Java contain the large *Tanygnathi* perhaps as rarities, but no Cockatoo, nor *Eclectus*; and the only Lory, if any, is *Eos ornata*, which Sir St. Raffles reported by mistake (?) to inhabit the Malayan Peninsula.*

With regard to the distribution of *species* in India and the neighbouring countries, we first remark three of *Palæornis* (*Alexandri*, *torquatus*, and *cynocephalus*,) as common—with unimportant local exceptions—to all India from the sub-Himalayan regions to Ceylon inclusive, and also to the eastward in Asám, Arakan, the Tenasserim provinces, and *P. torquatus* as far southward as Penang. Others are much more local, as *P. Calthrapæ* which is confined to the mountains of Ceylon, *P. columboides* to those of S. India, *P. schisticeps* to the sub-Himalayan regions, and *P. erythrogonis* (so far as known) to the Nicobar islands. Of *P. caniceps* we know of but two examples, one procured in the Nicobars, the other at or near Penang; and this may prove to be properly a species of Indo-China. In the hilly parts of Bengal, and along the S. E. sub-Himalayan regions, in Asám, Sylhet, Arakan, the Tenasserim provinces, and the Malayan peninsula to the latitude of Penang, *P. barbatus* abounds, and is common also in Sumatra, Java, and Borneo; but it is unknown in the Indian peninsula (though having for a synonyme the name *pondicerianus*), and it would seem equally so in the southern parts of the Malayan peninsula. In these latter countries its place would seem to be taken by *P. malaccensis*; and the range of *Tanygnathus malaccensis* and of *Loriculus galgulus* corresponds. In Malacca collections I have seen only the three last named species, added to which in Penang collections I have seen *P. torquatus*, *P. barbatus*, and one specimen of *P. caniceps*: while another of this last is the only Parrakeet which I have seen from the Nicobars in addition to *P. erythrogonis*. It is probable that both of these also inhabit the Andamans and the northern part of Sumatra. Of *Loriculus*, while *L. galgulus* would appear to be confined to the Malayan peninsula and Sumatra, and *L. asiaticus* (so

* We suspect that Raffles's statement of *Tanygnathus sumatranus* (of which he describes the female only, apparently from a captive individual,) inhabiting Sumatra, needs confirmation as much as that of *Eos ornata* inhabiting the Malayan peninsula. Dr. Horsfield does not mention any *Tanygnathus* or Lory as occurring in Java.

called) to Ceylon, *L. vernalis* ranges over the hilly regions of all India, with Asám, Arakan, the Tenasserim provinces, and also Java; like *Palæornis barbatus*, and similarly without invading (as it would seem) the regions tenanted by *L. galgulus* together with *P. malaccensis* and *Tanygnathus malaccensis*. It may further be remarked that the whole of these species are such as no zoologist would hesitate in regarding as indisputably distinct, with the exception of *Loriculus asiaticus*, which some would consider to be a local variety of *L. vernalis*; in which case the race of the Philippines (*L. rubrifrons*) and another we have seen figured with the entire head crimson, should likewise rank as varieties merely of *L. vernalis*.

Notice of Lient. STRACHEY'S Scientific Enquiries in Kumaon.

From J. THORNTON, Esq. Secretary to Government, N. W. P.

To Secretary, Asiatic Society, Calcutta.

SIR,—I am desired by the Honorable the Lieutenant-Governor, N. W. P. to request that you will lay before the Asiatic Society, the annexed copy of a letter from Lieutenant R. Strachey, Bengal Engineers, who has lately been engaged on scientific enquiries in Kumaon, under the orders of this Government.

2. Lieutenant Strachey has embarked for England in the March Steamer from Calcutta, carrying with him all his papers and collections, which will be placed at the disposal of the Honorable the Court of Directors.

3. Lieutenant Strachey had not sufficient time after his return from Kumaon, to prepare any of his papers for publication. This will be more advantageously and easily done in England. My present communication is designed to inform the Society, and through them the public generally, of the nature and extent of Lieutenant Strachey's researches, and of the quarter, whence further information respecting them may be expected.

I have the honor to be, Sir,

Your obedient humble servant,

J. THORNTON,

Agra, the 25th March, 1850.

Secy. to Govt. N. W. P.

From Lieut. R. STRACHEY, Esq.

To J. THORNTON, Esq. Secretary to Government, N. W. P.

SIR,—I have the honor to inform you that, in accordance with the permission granted to me by the Honorable Lieutenant Governor, I left Kumaon on the 4th Ultimo, having then brought to a conclusion my operations in that province.

In my letter to your address of the 3d April 1849, I explained fully the progress that I had made in my undertaking up to that date, and it will now therefore be only requisite that I should state what has been done in addition since that time, and to submit for the consideration of the Honorable Lieutenant Governor, my views as to the plan that should be adopted for the publication of the results of my enquiries.

The first object to which my attention was directed, the construction of the section of the Himalaya explanatory of its Botanical Geography, is still of necessity left incomplete ; but the materials for its compilation are very ample, and the additional knowledge that has been acquired by Major Madden and myself during the past year, will be of much value in completing this part of my undertaking.

The provisional drawings of that part of the line which was best known, to which I referred in my letter above alluded to, were completed and have been submitted to the Honorable Lieutenant Governor. A memoir to accompany and explain these drawings was drawn out by Major Madden, but owing to my not having had any opportunity of conferring with that gentleman on the matter and to my attention having been unavoidably diverted to other objects that came more immediately before me, this paper has not been yet brought into a form suitable for publication.

The whole of my herbarium which now contains upwards of 2,000 species is now on its way to Calcutta, whence it will be sent on to England. On its arrival there I propose to undertake the comparison of the whole of it with properly named specimens, such as are to be found in the great Botanical collections in Europe, and then to draw out a fresh section with all the care that can be bestowed upon it.

I should likewise propose to draw out, if it be practicable, a catalogue of all the plants contained in my herbarium. This would form a valuable index to the Botany of this part of the Himalaya, and in it could be embodied descriptions of new plants, and identifications of synonyms,

besides some short description of the nature of each plant and the locality in which they are found.

I have greatly increased my knowledge of the Geological structure of Kumaon and Gurhwal during the past year, and I have added to my former collections a very considerable number of fossil shells &c., from the northern part of the mountains, from which I feel confident that the geological age of the strata in which these are found may be perfectly ascertained; and on the whole I consider that I shall be able to draw out a very fair geological map of Kumaon and Gurhwal, as well as geological sections such as were at first proposed.

My geological specimens are also now on their way to England with the herbarium.

In the department of Zoology matters are just as they were; the few specimens that I collected have likewise been dispatched to Calcutta.

The panoramic drawing of the mountains from the summit of Binson, has been completed, as I before said it had begun; this has also been laid before the Honorable Lieutenant Governor.

During the past season also my brother Captain H. Strachey, 66 Native Infantry, and I have been able to make some important additions to the topography of the country to the north of the snowy range in Kumaon and Gurhwal, by fixing, by trigonometrical operations, the position of the celebrated peak of Kailas, and of several other points of note. A map showing the combined result of this work and what was before known of this country has been executed by my brother, and has been shown to the Honorable Lieutenant Governor.

The calculations, on which the constructions of the map rests, were worked out by me sufficiently to permit of its being executed, but they take much time and must be carefully revised before any numerical results are published.

The meteorological observations which I was anxious to undertake have been conducted with as great care as was possible, and I have collected a considerable map of materials, which will I trust be a valuable addition to our knowledge of the phænomena in question. Besides other ordinary registers, I was enabled with the help of my brother Captain H. Strachey to make horary observations for a period of 24 hours at an elevation of 18,400 feet, as well as similar horary observa-

tions for periods of several days in succession both at Niti, at about 11,500 feet, and at another place at a height of about 16,500 feet above the sea. I propose to undertake the reduction of these observations as soon after my return to England as is possible.

Magnetic observations of dip and intensity have been made by me at a great number of stations in Kumaon and Gurhwal, up to the elevation of 18,400 feet. On my way down to Calcutta, I have also observed the dip at some of the places at which I stopped.

In conclusion it appears to me that the best form in which the result of my enquiries in Kumaon can be published is, as a work on the Physical Geography of this part of the Himalaya. It is of course out of my power to offer to undertake any thing of this sort from my own private resources, but should the Honorable Court of Directors consider that the information which I have acquired is of sufficient value to induce them to give their countenance to such a work, and should they be satisfied with my ability to execute it in a becoming way, I shall consider it to be my first duty to undertake it and to devote myself entirely to its completion.

I have the honor to be, &c.

(Signed) R. STRACHEY,

Late on special duty in Kumaon.

(True Copy)

J. THORNTON,

Assistt. Secretary to the Govt. N. W. P.

Calcutta, the 7th March, 1850.

Memorandum relative to the Storms of Wind experienced in Tartary, with suggestions relative to them, for the Mission proceeding there.
—By HENRY PIDDINGTON, President of Marine Courts.

The following Memorandum was drawn up for the use of the Mission proceeding to Chinese Tartary in 1847, which, as then announced, expected to winter at Yarkuud. Documents of this nature are, the Editors think, always worthy of permanent record, inasmuch as they fulfil their object not only at the time, but in future, when other expeditions or opportunities for observation may occur, and are moreover scientific notes which are too useful to be lost, and do not readily occur in all their bearings to any but those whose minds have been directed to the questions to which they relate.—EDS.

1. Heavy storms of wind, which either from their violence, or their veering to different points while blowing, or from both, are by all

writers, from the Chinese travellers and Marco Polo down to Humboldt and Ehrmann, called *Hurricanes*, are undoubtedly most frequent, both in the steppes and mountain chains of Tartary and Siberia.

2. Now as connected both with Meteorology in general, and especially with the new science of the Law of Storms these *land hurricanes* in all countries are of the highest interest, but in the countries above named especially so, for the elevation, cold, and dryness of the air may develop phænomena of importance tending to disclose to us their *causes*, or they may furnish us with confirmations or modifications of the laws now supposed to govern storms.

3. There are two great questions arising on the consideration of them which are—

A. Are they *strait-lined* currents of air, blowing from one point to another? or are they curves, and thus parts of rotatory storms? and if so which way do they turn? and do they move onwards also?

B. Where are they formed? and how do they begin? at the surface of the earth? or in the atmosphere? in a word, are they, like water-spouts, *descending* storms?*

4. The first question is easily solved if we have only observations. If the wind is a strait stream there will be no change in its direction while blowing. If it is part of a circular storm moving onwards the wind will veer according to fixed laws. If it be a circular storm, but *stationary*, as some are, it will *seem* to be a strait blowing wind at the place of the observer, but if observations at a distance can be had, then it will be seen that it was *really* blowing in a circle or curve.

5. To explain this I send herewith a transparent horn-card on which the winds are marked as they turn (against the hands (hours) of a watch) in the northern hemisphere. In the southern hemisphere they turn *with* the hours.

6. This card may be supposed to represent any sized rotatory storm, from a tornado of 100 yards to a storm of 1000 miles in diameter.

7. Now Humboldt and other travellers in Siberia speak of “horrible tempests” of wind and rain from the plains of Tartary from the

* There is some evidence, which will appear in a work I am now printing tending to shew that hurricanes at sea *are* descending storms! hence the great importance of this query.

S. E. It will be seen by looking at the wind card, that supposing the wind due S. E. throughout the storm, it may be part of a great circle of wind and if it veers at all, that, as we shall shew presently below, it must be travelling along on a certain track.

8. For : make a mark with a fly on a sheet of paper to represent the place of observation.

Place the horn card with the point marked E. N. E. upon the flag. This is we will suppose the state of things when the E. N. E. wind is rising to the strength of a gale.

9. Now move the card gradually over the flag *to the left* till the S. E. point is over it, and it will be seen that the wind has gradually become E. b. N., East, E. b. S., E. S., E. S. E. b. E. and S. E. and that such veering of the wind indicates a circular storm moving up *from* E. b. S. to W. b. N. In such a case the greatest violence will be felt and the Barometer will be lowest when the wind is about E. b. S. because then the centre is nearest.

10. Again : put the card at the S. E. *wind-point* over the flag and move it up *to the right* till the N. W. wind-point comes over the flag.

Now, at half-way you will see that the flag is at the vacant space in the centre of the card. This is *the centre of the hurricane*, in which, between the Tropics, there is most frequently a dead calm before the shift, but often none ; and the wind shifts or veers very rapidly to the opposite quarter or thereabouts, and blows as hard as ever.

11. This is the case of a storm moving up *from* the S. W. to the N. E. and its centre passing exactly over you.

12. We do not know that all or any part of this will occur, but it is easy to know if it does, if the veering of the wind be registered ; and at the same time the Barometer, or Simpiesometer, or both. I give now two suppositious registries of storm days, such as would be invaluable to us.

No. I.

September 15th, 1847.—At 9 A. M. encamped at Chueu-lung, the guides predicting a storm.

Secured every thing. My tent between two rocks just at the entrance of a little defile, whence a good view of the plain to the east, south, and round to N. W. and by a few paces round the rock the rest of the horizon could be seen. 9½ A. M. wind E. N. E. Bar.

— Ther. — wind piercing cold, and rising and falling with a sort of moaning noise.

Sky, light, hazy, vapory blue, and very thin sheets of scud flying from N. E. and north.

10 A. M. Blowing hard at E. b. N.

Bar. — Ther. —.

Strong haze above, dust-storm below, like those on the plains of India in the hot winds.

Noon : hurricane at due East tearing up everything ; tent would go if not for the shelter of the rocks, Bar. — Ther. —.

Wind cold, some blasts warmer ; blowing in heavy squalls. Barometer evidently oscillating with the squalls. Packed it up for fear of accident. At 12h. 45m the horizon one mass of dust, but a singular blue circle above us comparatively clear : subtends an arch of 45° or 50° .

1 P. M. more interval between the blasts. Wind E. S. E. Ther.—

2 P. M. wind S. E. b. E. more moderate but blowing hard.

2.30. P. M. moderate but strong gale at S. E. Set up Barometer again, Bar. — Ther. —.

3 P. M. moderating fast and our guides say all is over.

During the whole of the storm the dryness remarkable.

By shading the eyes, faint flashes of lightning could be seen. No thunder heard ; but the roaring of the wind would prevent it if the thunder was not loud.

Guides say sometimes thunder, sometimes not ; and that though it never rains with these storms in summer ; in winter it snows with them ; but they cannot say if the snow *falls* or drifts like the dust. They say that sometimes there is a dead calm in the middle of the hurricane, and that the wind then comes from the opposite quarter and that these are the most violent storms. They speak of these with much dread.

No. II.

At Iskardo, October 22nd.—Our landlord sent his servants to secure all the doors and windows, saying we were going to have a storm.

Sky clear, but from the gallery to the S. W. a dense low lead-coloured cloud could be seen about ten degrees in altitude and subtending an arch from south nearly to west. Sky hazy, no scud or drift. Sun rose

very red. Wind south and light, rising and falling with a moaning noise. At 10 A. M. wind S. E. blowing very strong in squalls. Bar. — and oscillating about, .03 to .05 every quarter of an hour or less. Ther. —. The whole horizon is now covered with a sort of dark haze which is, I suppose, mostly dust. No rain. Above clear hazy blue sky with very thin wreaths of scud flying to the N. W. very fast, and these are thicker and more numerous towards the dark haze and in the S. W. than at the zenith when they disappear. 10h. 30m. Bar. — Ther. —. Wind steady at S. E. Bar. oscillating .05 to .07 in the squalls of wind, which are now almost of hurricane strength, &c. Noon, a hurricane from S. E. roaring heavily; the sky one mass of dust mingled with spiculæ of ice or snow. Impossible to look to windward. Tiles and planks flying about like feathers. Our landlord says that many persons are hurt and some killed in these storms. Bar. oscillates much less. *Wind seems to oscillate also* being from S. E. to E. S. E. or even East (as far as we can judge) and then coming back to S. East again.

At 12° 30' it fell a dead calm in a few minutes. Bar. — Ther. — a slight feeling of oppression.

At $\frac{1}{4}$ to 1 P. M. we heard a low roaring sound which gradually became louder and at 1 the hurricane burst forth again from the S. W. with a few sharp flashes of lightning (but no thunder) blowing harder than before. Bar. at 1 P. M. — Ther.

1.	30.	} P. M. Bar.	Ther.
At 2.			
2.	30.		

&c. &c. &c. to the end of the storm.

13. A set of observations like this; i. e. one or more storms carefully observed throughout, with all the details (*and the more details the better*) would be invaluable from these countries. Notes on the common dust-whirlwinds also, whatever be their size, will be useful in explaining what is desired as to them. Every thing in fact relating to the phænomena of wind and its attendant clouds, electricity, &c. must be of interest and probably of use. The question also of the existence of any thing like the Simooms of the Sahara in the desert of Cobi* would be worth settling.

14. If any knowledge on the subject of these tempests can be col-

* During the summer.

lected from guides, travellers, &c. it may be valuable, and I add a few queries which will suggest more.

15. If it could be possible to establish the dates of the occurrences of storms at various points we might thus also obtain other evidence of their progression and routes, as also of their rates of travelling. Thus if a storm was felt at Yarkund on the 10th, and at Iskardo on the 13th, and we found that it *was* travelling to the S. westward at Yarkund the probabilities then are, that it is the same storm which has taken three days to pass over this distance. If its passage over an intermediate station was known this would be a certainty. At sea circular storms travel from $1\frac{3}{4}$ up to 48 miles an hour on their tracks.

Queries to be put as occasion offers to guides, travellers, head-men of villages, &c.

1. What are the names by which you call the different kinds of whirlwinds and storms of wind of all kinds, large and small?

2. Why do you call them by those names? Are the names only those of their deities, &c. or because of their motion, or of their effects?

3. Are these names Tartar or Chinese?

4. Do you know the kinds of wind-storms which the Chinese call by the names of

A. *Tae-fung* (great wind).

B. *Kow-fung* or *fung-kou* (great turning wind?)

C. *T'ee-hwuy* (Iron whirlwind).

D. *Tee-kew* (Iron whirlwind).

E. A noise before the typhoon called *L'een-fung* (a typhoon brewing), or any other kinds, and what are their Chinese and Tartarian names?

5. What are the effects of these various winds?

6. What are the Tartar names of the different gods or spirits of the winds?

7. Do you know of the goddess or spirit called by the Chinese *Keu-woo*? (The typhoon-mother).

8. Have you, or the Chinese, any temples dedicated to the spirits of the winds?

9. Have you any particular quarter of the heavens from which the storms come; like what the Chinese call *Luy-chow* (or the region of the thunder)?

10. What sacrifices are performed at the wind temples ?

11. Do you, or the Chinese, express the dread you have of these storms by the Chinese words *Chung wei che*. (There is a sincere awe or dread of it (the typhoon) ?

12. Do you express the termination of the storm by the Chinese words *Loc-se* (falling in the west) ?

13. How long do these storms last ; and what is the longest and shortest time of their duration ?

14. How do they begin ?

15. How do they continue ? strait from the same quarter or turning ?

16. How do they turn ?

17. Do they always turn the same way ?

18. At what time of the moon do they usually occur ?

19. How often in the year ?

20. Give the dates, years, and months of any of those which are recollected as being particularly violent, and where they occurred ?

21. In what parts are they most violent ?

22. And at what season of the year do they occur mostly, and when most violently ?

23. Are they storms of wind and dust only ; or of hail or snow or rain ?

24. Do the winter storms last longer than the summer ones ?

25. Do they ever overwhelm travellers, caravans, &c. and when and where does this occur ?

26. Do you know of their approach by any signs ; and what are these signs (sun, moon, stars, clouds, noises, behaviour of animals, &c.) ?

27. Are there (in the summer) any *hot* whirlwinds ? Describe them.

28. Is there ever a calm in the middle of the heavy wind-storms, and then does the wind begin to blow hard again, and is it then from the same point ?

29. Have you yourself been in these storms ?

30. Do they hurt your crops, or gardens, or animals ?

31. Do they ever seem to burn up the grass where they pass ?

32. Is there any thunder and lightning with them or at the end ?

33. Do they destroy houses if not well built ?

34. Are they most violent in the hills and mountain passes, or at the foot of them or when altogether in the plains?

35. In what countries are they most violent; i. e. do they do most mischief?

36. Have the volcanoes and the hurricanes any connection; that is, did you ever hear or know that the eruption of the volcanoes caused hurricanes?

37. Are there any parts of the country which you know or of which you have heard that cannot be traversed on account of the storms and when does this occur?

Of course no one individual will be able to reply to all these questions, but from the priests and head-men down to the guides, each may give his quota and their replies may lead to more information.

The religious part of the queries is of interest as like the other Chinese ones, it may shew the connection between the Chinese maritime storms and deities and the inland ones.

P. S. As illustrating this singular phænomenon of inland hurricanes, I add here a passage from the forthcoming new edition of the Sailor's Horn-Book, from which it would appear that hurricanes (as to violence) are perfectly well known to the Tchukutskoi of Behring's Straits! and they are also most frequent and severe, and true revolving storms in Iceland! See Vol. XIV. p. 297, of Jameson's Edinburgh Journal of Science in a paper on the Glaciers and climate of Iceland by W. Sartorius Von Walterhausen.

“Kotzebue in the *Rurick's* voyage of discovery, Vol. II. p. 160 of the 8vo. edition, describes a storm of hurricane violence on the 13th April, in Lat. $44^{\circ} 30'$ N. Long. 181° West, but he gives no account of the veering of the wind. Again in the voyage of the *Rurick*, Vol. I. p. 264, after a smart gale in the neighbourhood of the St. Lawrence Islands he was informed by the Tchukutskoi of St. Lawrence's Bay on the Asiatic Coast of Behring's Straits in $65^{\circ} 40'$ North “that the time of violent storms was at hand, and that the last had been only a faint wind. He gave us to understand that in a real storm nobody was able to stand on their legs, but that they were obliged to lay themselves flat on the ground.” This is exactly, as to violence, the description which a Carib of the West Indian islands might have given to Columbus, or which a Mauritius or Jamaica negro would give of their hurricanes in

the present day. I have heard it often said in descriptions of hurricanes there, by persons of all classes, that fearful that the dwelling-house might be blown down the family crept on the ground on all fours (lying flat down when the gusts were most furious) to reach the nearest negro hut or other low sheltered spot ; or a “hurricane house” built of stone for such occasions. Are these Behring’s Straits storms analogous to those which arise in the interior of the continent of North America and pass out to sea over Newfoundland ? and do the Asiatic storms arise in the plains of eastern Siberia and travel out towards Behring’s Straits ?”

Tables of Mortality according to the experience of the Bengal Civil Service, with the values of Annuities, Assurances, &c.—By Capt. J. C. HANNYNGTON, Bengal Army.

The following tables are founded on the data contained in a general list of the Civil Service of the Bengal Presidency which was published some years ago by Rámchander Dás under the superintendence of the Hon’ble H. T. Prinsep. A slight liberty has been taken with the ages under 25, in order to avoid irregularities in the premia for short assurances. The deviation is however small, and from 25 to 60, the actual data are very closely followed. After 60 the experience is too limited to be serviceable, and the table was thence continued and joined to the Northampton table by means of a curve and its ordinates.

The rate of mortality though higher than the English rates, is much more favourable than that determined by Mr. Woolhouse for the Bengal Military. The resulting rates of assurance premia are accordingly considerably less than those now used by Assurance offices. Nevertheless the rates here exhibited are beyond doubt sufficient ; for Mr. Nelson’s recent investigations on military lives give still lower rates, and hence it may be fairly inferred that the civil experience if further extended would lead to further reductions.

These remarks may serve to justify the publication of these tables, by shewing that they are fit to be used. The allusion to assurance rates will not it is hoped, be thought misplaced. It springs naturally

out of the subject, and vital statistics unless applied to the *business* of life assurance are of little worth. The tables have been prepared with attention to practical details, for practical purposes, in hope that they may be found useful.

It has not been considered necessary to add a summary of formulæ adapted to Commutation tables. They can be readily obtained by those who may require them.

TABLE I.—*Law of Mortality, Bengal Civil Service.*

Age.	Number that complete each year of age.	Number that die in the next year of age.	Sum of the living at all ages.	Mean duration of life.	Useful logarithms.			
x	l_x	$l_x - l_{x+1}$	$\Sigma (l_x)$	e_x	$\log. l_x$	$\text{colog. } l_x$	$\log. p_x$	$\text{colog. } p_x$
20	9085	153	274798	30.00	9583249	0416751	9926238	0073762
21	8932	151	265713	29.50	9509487	0490513	9925953	0074047
22	8781	149	256781	28.99	9435440	0564560	9825674	0174326
23	8632	148	248000	28.47	9361114	0638886	9924893	0075107
24	8484	147	239368	27.96	9286007	0713993	9924091	0075909
25	8337	147	230884	27.43	9210098	0789902	9922741	0077259
26	8190	145	222547	26.91	9132839	0867161	9922321	0077679
27	8045	145	214357	26.38	9055260	0944740	9921011	0078989
28	7900	144	206312	25.62	8976271	1023729	9920107	0079893
29	7756	144	198412	25.08	8896378	1103622	9981610	0018390
30	7612	145	190656	24.55	8814988	1185012	9916474	0083526
31	7467	145	183044	24.01	8731462	1268538	9914835	0085165
32	7322	146	175577	23.48	8646297	1353703	9912527	0087473
33	7176	146	168255	22.95	8558824	1441176	9910729	0089271
34	7030	146	161079	22.41	8469553	1530447	9908856	0091144
35	6884	148	154049	21.88	8378409	1621591	9905612	0094388
36	6736	151	147165	21.35	8284021	1715979	9901537	0098463
37	6585	154	140429	20.83	8185558	1814442	9897227	0102773
38	6431	157	133844	20.31	8082785	1917215	9892660	0107340
39	6274	160	127413	19.81	7975445	2024555	9887809	0112191
40	6114	165	121139	19.31	7863254	2136746	9881186	0118814
41	5949	167	115025	18.83	7744440	2255560	9876341	0123659
42	5782	171	109076	18.37	7620781	2379219	9869622	0130378
43	5611	174	103294	17.91	7490403	2509597	9863190	0136810
44	5437	176	97683	17.47	7353593	2646407	9857090	0142910
45	5261	178	92246	17.04	7210683	2789317	9850518	0149482
46	5083	179	86985	16.61	7061201	2938799	9844304	0155696
47	4904	181	81902	16.20	6905305	3094495	9836674	0163326
48	4723	181	76998	15.80	6742179	3257821	9830292	0169708
49	4542	180	72275	15.41	6572471	3427529	9824386	0175614

Age.	Number that complete each year of age.	Number that die in the next year of age.	Sum of the living at all ages.	Mean duration of life.	Useful logarithms.			
x	l_x	$l_x - l_{x+1}$	$\Sigma (l_x)$	e_x	$\log. l_x$	$\text{colog. } l_x$	$\log. p_x$	$\text{colog. } p_x$
50	4362	180	67733	15.03	6396857	3603143	9816983	0183017
51	4182	179	63371	14.65	6213840	3786160	9810016	0189984
52	4003	176	59189	14.29	6023856	3976144	9804729	0195271
53	3827	175	55186	13.92	5828585	4171415	9796723	0203277
54	3652	173	51359	13.56	5625308	4374692	9789236	0210764
55	3479	168	47707	13.21	5414544	4585456	9785048	0214952
56	3311	166	44228	12.86	5199592	4800408	9776614	0223386
57	3145	163	40917	12.51	4976206	5023794	9768870	0231130
58	2982	159	37772	12.17	4745076	5254924	9762033	0737967
59	2823	155	34790	11.82	4507109	5492891	9754749	0245251
60	2668	150	31967	11.48	4261858	5738142	9748699	0251301
61	2518	147	29299	11.14	4010557	5989443	9738759	0261241
62	2371	142	26781	10.80	3749316	6250684	9731785	0268215
63	2229	138	24410	10.45	3481101	6518899	9722439	0277561
64	2091	135	22181	10.11	3203540	6796460	9710149	0289851
65	1956	130	20090	9.77	2913689	7086311	9701319	0298681
66	1826	127	18134	9.43	2615008	7384992	9686926	0313074
67	1699	122	16308	9.10	2301934	7698066	9676383	0323617
68	1577	118	14609	8.77	1978317	8021683	9662236	0337764
69	1459	114	13032	8.43	1640553	8359447	9646670	0353330
70	1345	110	11573	8.10	1287223	8712777	9629447	0370553
71	1235	104	10228	7.78	0916670	9083330	9617956	0382044
72	1131	100	8993	7.45	0534626	9465374	9597961	0402039
73	1031	95	7862	7.13	0132587	9867413	9580171	0419829
74	936	90	6831	6.80	9712758	0287242	9560946	0439054
75	846	85	5895	6.47	9273704	0726296	9540143	0459857
76	761	80	5049	6.13	8813847	1186153	9517624	0482376
77	681	75	4288	5.80	8331471	1668529	9493255	0506745
78	606	70	3607	5.45	7824726	2175274	9466922	0533078
79	536	67	3001	5.10	7291648	2708352	9420080	0579920
80	469	63	2465	4.75	6711728	3288272	9373532	0626468
81	406	60	1996	4.41	6085260	3914740	9305501	0694499
82	346	57	1590	4.09	5390761	4609239	9218217	0781783
83	289	55	1244	3.80	4608978	5391022	9083181	0916819
84	234	48	955	3.58	3692159	6307841	9006970	0993030
85	186	41	721	3.37	2695129	7304871	8918551	1081449
86	145	34	535	3.19	1613680	8386320	8839550	1160450
87	111	28	390	3.01	0453230	9546770	8737551	1262449
88	83	21	279	2.86	9190781	0809219	8733136	1266864
89	62	16	196	2.66	7923917	2076083	8703661	1296339
90	46	12	134	2.41	6627578	3372422	8687211	1312789
91	34	10	88	2.09	5314789	4685211	8487323	1512677
92	24	8	54	1.75	3802112	6197888	8239088	1760912
93	16	7	30	1.37	2041200	7958800	7501225	2498775
94	9	5	14	1.05	9542425	0457575	6478175	3521825
95	4	3	5	0.75	6020600	3979400	3010300	6989700
96	1	1	1	0.50	0000000	0000000	0000000	0000000

TABLE II.—*Annuities, Assurances, &c. Four per Cent.*

Age x.	D.	N.	S.	M.	R.	Annuity. a_x
20	4146.28	62701.09	864804.71	1575.218	31014.528	15.122
21	3919.66	58781.43	802103.62	1508.077	29439.310	14.998
22	3705.19	55076.24	743322.19	1444.361	27931.233	14.865
23	3502.23	51574.01	688245.95	1383.908	26486.872	14.726
24	3309.79	48264.22	636671.94	1326.170	25102.964	14.582
25	3127.35	45136.87	588407.72	1271.028	23776.794	14.433
26	2954.04	42182.83	543270.85	1218.007	22505.766	14.280
27	2790.14	39392.69	501088.02	1167.718	21287.759	14.119
28	2634.47	36758.22	461695.33	1119.364	20120.041	13.953
29	2486.97	34271.25	424937.11	1073.190	19000.677	13.780
30	2346.92	31924.33	390665.86	1028.793	17927.487	13.603
31	2213.67	29710.66	358741.53	985.806	16898.694	13.421
32	2087.19	27623.47	329030.87	944.472	15912.889	13.235
33	1966.90	25656.57	301407.40	904.454	14968.417	13.044
34	1852.77	23803.80	275750.83	865.976	14063.962	12.848
35	1744.51	22059.29	251947.03	828.977	13197.986	12.645
36	1641.35	20417.94	229887.74	792.914	12369.009	12.440
37	1542.84	18875.10	209469.80	757.535	11576.095	12.237
38	1448.81	17426.29	190594.70	722.841	10818.560	12.028
39	1359.08	16067.21	173168.41	688.832	10095.718	11.822
40	1273.48	14793.73	157101.20	655.506	9406.886	11.617
41	1191.45	13602.28	142307.47	622.460	8751.380	11.417
42	1113.47	12488.81	128705.19	590.300	8128.920	11.217
43	1038.98	11449.83	116216.38	558.636	7538.621	11.020
44	968.038	10481.792	104766.546	527.656	6979.984	10.828
45	900.675	9581.117	94284.754	497.525	6452.328	10.638
46	836.732	8744.385	84703.637	468.224	5954.803	10.451
47	776.218	7968.167	75959.252	439.891	5486.579	10.265
48	718.816	7249.351	67991.085	412.344	5046.688	10.085
49	664.681	6584.670	60741.734	385.856	4634.344	9.909
50	613.788	5970.882	54157.064	360.528	4248.488	9.728
51	565.827	5405.055	48186.182	336.174	3887.960	9.553
52	520.777	4884.278	42781.127	312.887	3551.786	9.379
53	478.731	4405.547	37896.849	290.870	3238.899	9.203
54	439.269	3966.278	33491.302	269.821	2948.029	9.029
55	402.366	3563.912	29525.024	249.813	2678.208	8.857
56	368.207	3195.705	25961.112	231.130	2428.395	8.679
57	336.295	2859.410	22765.407	213.379	2197.266	8.503
58	306.601	2552.809	19905.997	196.620	1983.886	8.326
59	279.090	2273.719	17353.188	180.901	1787.266	8.147

TABLE II.—(Continued).

Age x.	D.	N.	S.	M	R.	Annui- ty. a_x
60	253.621	2020.098	15079.469	166.167	1606.3653	7.965
61	230.156	1789.942	13059.371	152.456	1440.1988	7.769
62	208.384	1581.558	11269.429	139.536	1287.7428	7.590
63	188.369	1393.189	9687.871	127.536	1148.2065	7.396
64	169.911	1223.278	8294.6823	116.323	1020.6704	7.200
65	152.7275	1070.5504	7071.4044	105.775	904.3479	7.010
66	137.1830	933.3674	6000.8540	96.0080	798.5733	6.804
67	122.7325	810.6349	5067.4866	86.8338	702.5653	6.605
68	109.5380	701.0969	4256.8517	78.3597	615.7315	6.401
69	97.4440	603.6529	3555.7548	70.4787	537.3718	6.195
70	86.3751	517.2778	2952.1019	63.1577	466.8931	5.989
71	76.2605	441.0173	2434.8241	56.3652	403.7355	5.783
72	67.1525	373.8648	1993.8268	50.1903	347.3702	5.567
73	58.8606	315.0042	1619.9420	44.4812	297.1799	5.351
74	51.3817	263.6225	1304.9378	39.2662	252.6987	5.131
75	44.6550	218.9675	1041.3153	34.5157	213.4325	4.904
76	38.6234	180.3441	822.3478	30.2016	178.9169	4.669
77	33.2338	147.1103	642.0037	26.2975	148.7153	4.426
78	28.4362	118.6741	494.8934	22.7782	122.4178	4.173
79	24.1842	94.4899	376.2193	19.6198	99.6396	3.907
80	20.3473	74.1426	281.7294	16.71302	80.01985	3.644
81	16.9366	57.2060	207.5868	14.08494	63.30682	3.378
82	13.8785	43.3275	150.3808	11.67826	49.22189	3.122
83	11.1463	32.1812	107.0533	9.47986	37.54362	2.887
84	8.67791	23.50329	74.87207	7.44018	28.06377	2.708
85	6.63253	16.87076	51.36878	5.72855	20.62359	2.544
86	4.97165	11.89911	34.49802	4.32278	14.89504	2.393
87	3.65951	8.23960	22.59891	3.20185	10.57226	2.252
88	2.62114	5.60846	14.35931	2.31423	7.37041	2.132
89	1.88984	3.71862	8.75085	1.67413	5.05618	1.968
90	1.34821	2.370411	5.032226	1.205185	3.382050	1.758
91	0.95818	1.412236	2.661815	0.867006	2.176865	1.474
92	0.65034	0.761891	1.249579	0.596029	1.309859	1.172
93	0.41689	0.345003	0.487688	0.387585	0.713830	0.828
94	0.22548	0.119522	0.142686	0.212211	0.326246	0.530
95	0.09636	0.023163	0.023163	0.091762	0.114035	0.240
96	0.02316	0.000000	0.000000	0.022272	0.022272	0.000

TABLE III.—Five per Cent.

Age.	D.	N.	Annuity. a_x
20	3424.04	45633.46	13.327
21	3206.07	42427.39	13.233
22	3001.78	39425.61	13.134
23	2810.33	36615.28	13.029
24	2630.62	33984.66	12.919
25	2461.94	31522.72	12.804
26	2303.36	29219.36	12.686
27	2154.84	27064.52	12.560
28	2015.24	25049.28	12.430
29	1884.29	23164.99	12.293
30	1761.25	21403.74	12.153
31	1645.42	19758.32	12.008
32	1536.64	18221.68	11.858
33	1434.29	16787.39	11.704
34	1338.19	15449.20	11.545
35	1248.00	14201.20	11.379
36	1163.02	13038.18	11.210
37	1082.81	11955.37	11.041
38	1007.13	10948.24	10.870
39	935.754	10012.487	10.699
40	868.467	9144.020	10.529
41	804.530	8339.490	10.365
42	744.957	7594.533	10.194
43	688.494	6906.039	10.030
44	635.375	6270.664	9.869
45	585.531	5685.133	9.709
46	538.781	5146.352	9.551
47	495.055	4651.297	9.395
48	454.079	4197.218	9.243
49	415.883	3781.335	9.092
50	380.383	3400.952	8.940
51	347.320	3053.632	8.792
52	316.623	2737.009	8.644
53	288.287	2448.722	8.493
54	262.004	2186.718	8.346
55	237.708	1949.010	8.199
56	215.456	1733.554	8.046
57	195.108	1538.446	7.885
58	176.006	1362.440	7.741
59	158.687	1203.753	7.585

TABLE III.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	142.833	1060.920	7.427
61	128.383	932.537	7.262
62	115.132	817.405	7.099
63	103.082	714.323	6.929
64	92.096	622.227	6.756
65	82.073	540.154	6.581
66	72.947	467.207	6.404
67	64.641	402.566	6.228
68	57.143	345.423	6.045
69	50.349	295.074	5.861
70	44.205	250.869	5.675
71	38.656	212.213	5.489
72	33.716	178.497	5.294
73	29.2712	149.2258	5.098
74	25.3086	123.9172	4.896
75	21.7858	102.1314	4.688
76	18.6637	83.4677	4.472
77	15.9064	67.5613	4.247
78	13.4805	54.0808	4.011
79	11.3556	42.7252	3.762
80	9.4630	33.2622	3.515
81	7.80177	25.46043	3.263
82	6.33218	19.12825	3.020
83	5.03716	14.09109	2.797
84	3.88432	10.20677	2.627
85	2.94051	7.26626	2.471
86	2.18317	5.08309	2.328
87	1.59167	3.49142	2.193
88	1.13350	2.35792	2.080
89	0.80639	1.55153	1.924
90	0.56980	0.98173	1.723
91	0.40110	0.58063	1.447
92	0.26965	0.31098	1.153
93	0.17120	0.13978	0.816
94	0.09172	0.04806	0.524
95	0.03882	0.00924	0.238
96	0.00924	0.00000	0.000

TABLE IV.—*Six per Cent.*

Age.	D.	N.	Annuity. a_x
20	2832.75	33648.08	11.878
21	2627.40	31020.68	11.807
22	2436.77	28583.91	11.730
23	2259.83	26324.08	11.649
24	2095.37	24228.71	11.563
25	1942.51	22286.20	11.473
26	1800.24	20485.96	11.380
27	1668.28	18817.63	11.280
28	1540.48	17277.20	11.215
29	1431.42	15845.78	11.070
30	1325.33	14520.45	10.956
31	1226.49	13293.96	10.921
32	1134.597	12159.364	10.717
33	1049.032	11110.332	10.591
34	669.518	10140.814	10.460
35	895.644	9245.170	10.322
36	826.782	8418.388	10.182
37	762.498	7655.890	10.040
38	702.515	6953.375	9.898
39	646.570	6306.805	9.756
40	594.416	5712.389	9.610
41	545.637	5166.752	9.469
42	500.301	4666.451	9.327
43	458.024	4208.427	9.188
44	418.698	3789.729	9.051
45	382.213	3407.516	8.915
46	348.378	3059.138	8.781
47	317.084	2742.154	8.648
48	288.095	2453.959	8.518
49	261.372	2192.587	8.389
50	236.806	1955.781	8.259
51	214.183	1741.598	8.131
52	193.411	1548.187	8.004
53	174.441	1373.746	7.875
54	157.041	1216.705	7.747
55	141.1341	1075.5709	7.621
56	126.7158	948.8551	7.488
57	113.5498	835.3053	7.356
58	101.5704	733.7349	7.224
59	90.7120	643.0229	7.089

TABLE IV.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	80.8787	562.1442	6.950
61	72.0108	490.1334	6.806
62	63.9687	426.1647	6.662
63	56.7336	369.4311	6.512
64	50.2087	319.2224	6.358
65	44.3086	274.9138	6.204
66	39.0224	235.8914	6.045
67	34.2532	201.6382	5.887
68	29.9939	171.6443	5.723
69	26.1789	145.4654	5.557
70	22.7673	122.6981	5.389
71	19.7219	102.9762	5.222
72	17.0389	85.93736	5.047
73	14.65313	71.28423	4.865
74	12.54994	58.73429	4.680
75	10.70115	48.03314	4.489
76	9.08111	38.95203	4.289
77	7.66647	31.28556	4.081
78	6.43599	24.84957	3.861
79	5.37033	19.47924	3.627
80	4.43300	15.04624	3.394
81	3.62036	11.42588	3.156
82	2.91068	8.51520	2.296
83	2.29356	6.22164	2.713
84	1.75196	4.46968	2.551
85	1.31376	3.15592	2.402
86	0.96619	2.18973	2.266
87	0.69777	1.49196	2.138
88	0.49222	0.99974	2.031
89	0.34687	0.65287	1.882
90	0.24279	0.41008	1.689
91	0.16930	0.24078	1.422
92	0.11274	0.12804	1.136
93	0.07091	0.05713	0.806
94	0.03763	0.01950	0.518
95	0.01578	0.00372	0.236
96	0.00372	0.00000	0.000

TABLE V.—Seven per Cent.

Age.	D.	N.	Annuity. a_x
20	2347.74	25108.99	10.695
21	2157.19	22951.80	10.640
22	1981.89	20967.91	10.581
23	1820.89	19149.02	10.511
24	1672.59	17476.43	10.449
25	1536.09	15940.34	10.377
26	1410.28	14530.06	10.303
27	1294.68	13235.38	10.223
28	1188.82	12046.56	10.133
29	1090.21	10956.35	10.050
30	999.967	9956.380	9.957
31	916.746	9039.634	9.860
32	840.135	8199.499	9.760
33	769.516	7429.983	9.655
34	704.542	6725.441	9.546
35	644.776	6080.665	9.431
36	589.639	5491.026	9.313
37	538.711	4952.315	9.193
38	491.692	4460.623	9.072
39	448.309	4012.314	8.950
40	408.295	3604.019	8.802
41	371.286	3232.733	8.707
42	337.256	2895.477	8.585
43	305.871	2589.606	8.466
44	276.996	2312.610	8.349
45	250.495	2062.115	8.232
46	226.186	1835.929	8.117
47	203.945	1631.984	8.002
48	183.568	1448.416	7.890
49	164.984	1283.432	7.779
50	148.280	1135.152	7.655
51	132.682	1002.470	7.555
52	118.694	883.776	7.437
53	106.0518	777.7241	7.333
54	94.5816	683.1425	7.223
55	84.2067	598.9358	7.113
56	74.8976	524.0382	6.997
57	66.4883	457.5499	6.882
58	58.9181	398.6318	6.766
59	52.1276	346.5042	6.647

TABLE V.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	46.0425	300.4617	6.526
61	40.6112	259.8505	6.398
62	35.7386	224.1119	6.271
63	31.4002	192.7117	6.137
64	27.5391	165.1726	5.998
65	24.0671	141.1055	5.863
66	21.0077	120.0978	5.712
67	18.2591	101.8387	5.577
68	15.8392	85.9995	5.429
69	13.6954	72.3041	5.279
70	11.7993	60.5048	5.128
71	10.1256	50.3792	4.977
72	8.66624	41.71297	4.813
73	7.38317	34.32980	4.650
74	6.26436	28.06544	4.480
75	5.29160	22.77384	4.304
76	4.44854	18.32530	4.120
77	3.72046	14.60484	3.926
78	3.09413	11.51071	3.720
79	2.55768	8.95303	3.500
80	2.09156	6.86147	3.281
81	1.69215	5.16932	3.055
82	1.34774	3.82158	2.836
83	1.05207	2.769512	2.632
84	0.796119	1.973393	2.479
85	0.591415	1.381978	2.337
86	0.430886	0.951092	2.207
87	0.308272	0.642820	2.085
88	0.215430	0.427390	1.984
89	0.150396	0.276994	1.842
90	0.104283	0.172711	1.656
91	0.072037	0.100674	1.398
92	0.047523	0.053151	1.118
93	0.029609	0.023542	0.795
94	0.015566	0.007976	0.512
95	0.006465	0.001511	0.234
96	0.001511	0.000000	0.000

TABLE VI.—*Eight per Cent.*

Age.	D.	N.	Annuity. a_x
20	1949.170	18926.567	9.710
21	1774.393	17152.174	9.670
22	1615.182	15536.992	9.619
23	1470.162	14066.830	9.568
24	1337.921	12728.909	9.514
25	1217.351	11511.558	9.456
26	1107.302	10404.256	9.396
27	1007.128	9397.128	9.331
28	915.7185	8481.4097	9.262
29	832.4322	7648.9775	9.189
30	756.2602	6892.7173	9.114
31	687.0838	6205.6335	9.032
32	623.8348	5581.7987	8.948
33	566.1070	5015.6917	8.860
34	513.5085	4502.1832	8.767
35	465.5962	4036.5870	8.670
36	421.8392	3614.7478	8.569
37	381.8360	3232.9118	8.467
38	345.2835	2887.6283	8.363
39	311.9019	2575.7264	8.258
40	281.4331	2294.2933	8.152
41	253.5537	2040.7396	8.049
42	228.1815	1812.5581	7.943
43	205.0306	1607.5275	7.840
44	183.9560	1423.5715	7.739
45	164.8160	1258.7555	7.637
46	147.4441	1111.3114	7.537
47	131.7146	979.5968	7.438
48	117.4567	862.1401	7.340
49	104.5883	757.5518	7.243
50	93.0032	664.5486	7.145
51	82.5606	581.9880	7.049
52	73.1729	508.8151	6.954
53	64.7738	444.0413	6.855
54	57.2332	386.8081	6.758
55	50.4833	336.3248	6.662
56	44.4866	291.8382	6.560
57	39.1261	252.7121	6.459
58	34.3503	218.3618	6.357
59	30.1099	188.2519	6.252

TABLE VI.—(Continued.)

Age.	D.	N.	Annuity. a_x
60	26.3488	161.9031	6.145
61	23.0254	138.8777	6.031
62	20.0752	118.8025	5.918
63	17.4748	101.3377	5.799
64	15.1787	86.1490	5.676
65	13.1370	73.0120	5.558
66	11.3640	61.6480	5.426
67	9.79043	51.85758	5.297
68	8.41427	43.44331	5.163
69	7.20803	36.23528	5.027
70	6.15261	30.08267	4.889
71	5.24095	24.84172	4.740
72	4.43559	20.40613	4.601
73	3.74390	16.66223	4.451
74	3.14515	13.51708	4.298
75	2.63383	10.88325	5.132
76	2.19371	8.68954	3.961
77	1.81768	6.87186	3.784
78	1.49768	5.37418	3.588
79	1.22656	4.14762	3.382
80	0.993741	3.153880	3.174
81	0.796531	2.357349	2.960
82	0.628533	1.728816	2.751
83	0.486101	1.242715	2.557
84	0.364437	0.878278	2.410
85	0.278221	0.610057	2.275
86	0.193608	0.416449	2.151
87	0.137232	0.2792173	2.035
88	0.0950143	0.1842030	1.939
89	0.0657170	0.1184860	1.803
90	0.0451462	0.0733398	1.625
91	0.0308972	0.0424426	1.374
92	0.0201941	0.0222485	1.102
93	0.0124656	0.0097829	0.785
94	0.0064924	0.0032905	0.507
95	0.0026718	0.0006187	0.232
96	0.0006187	0.0000000	0.000

TABLE VII.—*Annual Premia for Assurances.
Four per Cent.*

Age.	One Year.	Two Years.	Three Years.	Four Years.	Five Years.	Six Years.	Seven Years.	Whole Life.
20	.01620	.01621	.01623	.01628	.01639	.01646	.01654	.02356
21	.01626	.01629	.01637	.01642	.01648	.01659	.01669	.02405
22	.01633	.01642	.01646	.01662	.01666	.01677	.01685	.02457
23	.01648	.01657	.01663	.01676	.01689	.01696	.01707	.02513
24	.01665	.01681	.01693	.01698	.01709	.01720	.01732	.02372
25	.01697	.01700	.01709	.01718	.01728	.01746	.01761	.02633
26	.01702	.01717	.01728	.01741	.01757	.01773	.01790	.02698
27	.01733	.01743	.01756	.01773	.01790	.01808	.01826	.02768
28	.01753	.01768	.01788	.01806	.01826	.01845	.01863	.02841
29	.01785	.01808	.01826	.01847	.01867	.01891	.01907	.02920
30	.01832	.01849	.01870	.01890	.01909	.01932	.01958	.03002
31	.01867	.01892	.01912	.01932	.01955	.01984	.02023	.03088
32	.01917	.01936	.01955	.01981	.02012	.02045	.02081	.03179
33	.01955	.01981	.02005	.02039	.02076	.02115	.02154	.03274
34	.01992	.02031	.02070	.02111	.02152	.02195	.02242	.03375
35	.02067	.02110	.02153	.02197	.02242	.02292	.02340	.03466
36	.02156	.02201	.02247	.02293	.02346	.02396	.02448	.03594
37	.02249	.02297	.02345	.02402	.02454	.02508	.02563	.03708
38	.02348	.02398	.02460	.02514	.02571	.02629	.02684	.03830
39	.02452	.02521	.02577	.02637	.02697	.02755	.02812	.03953
40	.02595	.02645	.02706	.02769	.02828	.02887	.02944	.04080
41	.02705	.02769	.02834	.02897	.02959	.03018	.03078	.04207
42	.02844	.02910	.02973	.03036	.03096	.03158	.03218	.04339
43	.02982	.03044	.03109	.03171	.03236	.03298	.03356	.04473
44	.03139	.03180	.03244	.03312	.03376	.03435	.03495	.04608
45	.03253	.03317	.03389	.03455	.03515	.03577	.03637	.04756
46	.03386	.03465	.03532	.03594	.03658	.03720	.03744	.04887
47	.03549	.03614	.03675	.03740	.03808	.03861	.03920	.05031
48	.03685	.03745	.03814	.03880	.03939	.04001	.04061	.05175
49	.03811	.03886	.03957	.04016	.04080	.04144	.04198	.05323
50	.03968	.04039	.04097	.04163	.04228	.04284	.04342	.05475
51	.04116	.04169	.04239	.04308	.04364	.04425	.04485	.05630
52	.04228	.04309	.04384	.04441	.04504	.04567	.04627	.05788
53	.04397	.04473	.04525	.04589	.04655	.04717	.04777	.05955
54	.04555	.04597	.04665	.04734	.04799	.04862	.04920	.06125
55	.04644	.04728	.04806	.04875	.04942	.05002	.05067	.06300
56	.04814	.04898	.04968	.05035	.05096	.05163	.05226	.06485
57	.04983	.05052	.05121	.05182	.05253	.05324	.05385	.06677
58	.05127	.05194	.05262	.05338	.05406	.05476	.05552	.06875
59	.05280	.05340	.05422	.05494	.05569	.05651	.05727	.07086
60	.05406	.05505	.05581	.05661	.05736	.05835	.05919	.07303

PROCEEDINGS
OF THE
ASIATIC SOCIETY OF BENGAL

FOR MARCH, 1850.

The usual monthly meeting of the Asiatic Society was held on the evening of the 6th March.

J. R. COLVIN, Esq. Member of the Council, in the chair.

The proceedings of the last meeting were read and confirmed.

Notes were recorded from Mr. Brandreth, Captain Baseley, Major Hannay and Capt. Staples withdrawing from the Society.

The following gentlemen were named as candidates for election at the April meeting.

C. T. Watkins, Esq.,—proposed by Mr. Heatly, and seconded by Mr. Blyth.

A. J. M. Mills, Esq. B. C. S.,—proposed by J. R. Colvin, Esq., and seconded by Dr. W. B. O'Shaughnessy.

T. Morton, Esq. Madras Medical Service,—proposed by J. R. Colvin, Esq., and seconded by Dr. W. B. O'Shaughnessy.

Hon'ble Capt. R. B. Byng,—proposed by Dr. O'Shaughnessy, and seconded by J. R. Colvin, Esq.

The Rev. Principal Kay of Bishop's College,—proposed by Rev. S. Slater, and seconded by F. E. Hall, Esq.

Letters were read—

1. From the Secretary to Government, Home Department, forwarding a plan of the city of Jagannath.

2. From Mr. Bowring, C. S. submitting a description of the Shekim district.

3. From H. Torrens, Esq. forwarding a plan and drawing of the Adiná Masjid.

It being stated that this monument is rapidly falling to ruin, it was agreed unanimously that the Society make a representation to Government, soliciting that measures be taken for its repairs and its preservation.

4. From Dr. Wise, forwarding a Bengali history of Tipperah. Referred to the Oriental Section. (And since the meeting, at Dr. Wise's request, made over for examination to Mr. Jones.)

5. From Mr. Laidlay, forwarding a series of maps, illustrative of his version of a Chinese treatise on the river courses of the countries West of China Proper.

6. From Mr. Laidlay, tendering his resignation of the office of Joint Secretary.

On the proposition of the Honorable President and the Council, the Society unanimously decided to place on record, "their grateful sense of the valuable services Mr. Laidlay has rendered to the Society, and of the happy combination of zeal, ability learning, and temper with which he has so long discharged the functions of Joint Secretary and Editor of the Journal."

It was further and unanimously voted that Mr. Laidlay's resignation be not accepted, and that he continue, during his absence, to be Joint Secretary to the Society.

Read again the resolution respecting Col. Forbes' retirement from the list of Vice-Presidents, proposed by Mr. Colvin, and seconded by Capt. Broome, at the January meeting—

"That as a testimony of the great respect and esteem of the Society Col. Forbes be elected an Honorary Vice-President of the Society (on the occasion of his retirement from the list of active Vice-Presidents) as was done on the retirement of Mr. H. Torrens."

Unanimously carried.

Read a letter from the Statistical Section communicating their desire to apply to Government for permission to consult certain records—also

a memorandum of the approval of the Council of the proposition submitted by the Section.

SIR,—We have the honour to request that you will be pleased to lay before the Society, with a view to its being forwarded, if approved of, the undermentioned suggestions of the Section appointed by the Society for the advancement of Statistical Science in India.

At a meeting of the Section the various means of obtaining Statistical Information were attentively considered, and it was proposed by Captain Staples and resolved unanimously that, as the resources at the command of the Section are very limited, and as the records in the office of the Government of Bengal are considerable, the Secretary of the Society be requested with sanction of the Society, to solicit Government to permit the Index of the papers now in the Bengal Secretariat Office, to be copied or published by the Society, and subsequently to permit such papers as the Society may consider valuable, and the Government may please to authorize, to be published or extracts taken from them; and secondly that the members of the Section or other properly authorized persons, be permitted access to the records or such portion of them, as the Government may be pleased to place at their disposal for the above purpose.

We have the honor to be, Sir,

Your most obedient servants,

N. A. STAPLES, *Br. Captain, Artillery.*

JAMES LONG, C. L. K.

S. G. T. HEATLY.

March 27th, 1850.

Unanimously adopted.

Mr. Piddington brought forward a resolution respecting lending of Books and MSS. and copying of MS.

The Librarian having submitted his usual monthly report, the meeting adjourned.

Confirmed, J. W. COLVILE, President.

W. B. O'SHAUGHNESSY, *V. P. and Secy.*

3rd April, 1850.

LIBRARY.

The following books have been received since the last meeting.

Presented.

Elements of Electro-Biology, or the Voltaic Mechanism of man; of Electro-Pathology, especially of the Nervous System; and of Electro-Therapeutics. By Dr. Alfred Smeee.—PRESENTED BY THE AUTHOR.

The Report of the British Association for the advancement of Science, for 1848.—BY THE ASSOCIATION.

Bulletin de la Société de Géographie, 3me, serie, Tome X.—BY THE SOCIETY.

An Apology for the 'Present System of Hindu Worship, Calcutta, 1817, 8vo.—BY H. PIDDINGTON, ESQ.

The Loghu Kaumudí, a Sanskrita Grammar, with an English Version. Part. I. BY DR. J. BALLANTINE.

Indische Alterthumskunde. Von C. Lassen. Zweiter Band. Geschichte von Buddha bis auf die Gupta-Könige. Bonn, 1849, 8vo.—BY THE AUTHOR.

Verhandelingen van het Bataviaasch Genootschap von Kunsten en Wetenschappen. Deel XXII.—BY THE BATAVIAN SOCIETY OF ARTS AND SCIENCES.

Œuvres de La Place. Tome VII. Theorie Analytique des Probabilites, Paris, 1847, 4to.—BY THE EDITOR.

The White Yajus Veda, edited by Albrecht Weber. Part II. The Satapatha Bráhmaṇa in the Mádhyandiní Sákhá, with extracts from the Commentaries of Sáyana, Harisvámin and Dvivedaganga, Berlin, 1849.—BY THE EDITOR.

Druckfehler, Berichtigungen und Nachträge zum ersten Bande.—BY THE EDITOR.

Barometrographia: Twenty years variation of the Barometer in the Climate of Britain, exhibited in autographic curves with the attendant winds and weathers, and copious notes illustrative of the subject. By Luke Howard, Esq. London, 1847, Rl. folio.—BY THE AUTHOR.

Zeitschrift der Deutschen morgenlandischen Gesellschaft, herausgegeben von den Geschäfts führen. Drittes Band, II. und III. Heft.—BY THE EDITORS.

Journal of the Royal Geographical Society of London, Vol. XIX, part I.—BY THE SOCIETY.

Transactions of the Royal Society of London for the year 1847.—BY THE SOCIETY.

Proceedings of the Royal Society of London, Nos. 68-72.—BY THE SAME.

List of the Fellows of the Royal Society, 1847.—BY THE SAME.

Address of the most noble the Marquis of Northampton, the President, read at the General Meeting of the Royal Society on Tuesday, June 9th 1848.—BY THE SAME.

Journal of the Indian Archipelago for January, 1850.—BY THE EDITOR.

Ditto ditto, 2 copies.—BY THE GOVERNMENT OF BENGAL.

Upadeshaka, No. 39.—BY THE EDITOR.

The Oriental Baptist, No. 39.—BY THE EDITOR.

The Calcutta Christian Observer for March, 1850.—BY THE EDITORS.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of January, 1850.—BY THE DEPUTY SURVEYOR GENERAL.

Tattvabodhiní Patriká, Nos, 78-9.

Purnachandrodaya, for February, 1850.—BY THE EDITOR.

Exchanged.

Journal Asiatique, Nos. 61-4.

Journal of the Royal Asiatic Society, Vol. XI. Part I. and Vol. XII. Part I.

Quarterly Journal of the Geological Society, Nos. 18-19.

Jameson's Journal, No. 93.

Purchased.

Comptes Rendus, Nos. 16 @ 21.

Histoire Naturelle des Poissons, Tome XXII.

Haji Khalfæ Lexicon Bibliographicum et Encyclopaedicum, Vol. V.

The Annals and Magazine of Natural History, for December, 1849.



